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Electric Light Applied to Special Purposes.

Outside of the ordinary illuminating purposes, electric light furnishes the means of attaining certain effects which could not be attained by the ordinary sources of light.

For instance, the projection of a powerful jet of light on a given point which is to be brightly illuminated at a distance could not have been easily resolved with oil or petroleum.

Such result, with those means of lighting cannot be easily obtained except by the use of heavy and cumbrous apparatuses only applicable to stationary focuses, such as light-houses.

For movable projectors electric light alone can be used.

It will not be necessary for our present purpose to refer to the sundry apparatuses of that kind which are used in naval and military applications.

They were represented at Munich only by a very simple machine of rather large size, which was used within the interior of the Crystal Palace, to produce certain effects of intense illumination.

A much more important machine containing new features was the illuminating carriage of Messrs. G. Schuckert and Meisthaler & Co.

For a great number of cases it is very useful to have the power of bringing to a given point all the materials necessary to electric lighting engineered in such a manner that the lighting apparatus may be set up within a very short time.

Such necessity has given rise, for example, in military applications, to the carriages intended to accompany electric projectors. At divers times heretofore we have had occasion to refer in this paper to those carriages, and especially to mention those which were manufactured by the firm of Sauther & Lemmonier.

The one which was exhibited by Messrs. G. Schuckert and Meisthaler & Co. did not differ much from them. A part of the same was a steam boiler, with a water-tank and a 4-cylinder steam engine acting directly on a dynamo-electric machine of the Schuckert's system.

But the most interesting part of the apparatus was a second carriage (Fig. 97) which could be hitched to the first one and a Piette & Kriziki's lamp with the necessary appendage to raise the same to a height of 8 meters (26 ft.)

That appendage or contrivance reposed on the principle of those combined, parallelograms used by children to move a whole army of little soldiers and which are called in *Nurembergish "Shears,"* (Nurnbergsche Scheere).

The support of that lamp, or illuminating tower, is composed of four sets of such Nurembergish Shears, combined and worked together, as shown by Figure 97.

That apparatus is folded down on the carriage for transportation.

The folding and unfolding (lowering and raising) is obtained by widening or narrowing its base by moving to and fro and along the four grooves on the top of the truck the four resting points which form the base of the folding. Such moving is obtained by means of a screw worked by a gear and a crank.

The lamp is suspended in the upper part of the tower by means of cords passing over pulleys. When the machine is folded the lamp sets down in a cylindric support or socket placed in the center of the carriage, to keep it fast in its place during transportation.

The carriage further bears four vertical screws, which can be used to wedge up the machinery very firmly.

The apparatus was exhibited outside of the Crystal Palace, not far from the entrance of the Exhibition, and during several evenings is was worked before the public in order to demonstrate the regularity of the work and the fixity of the lamp.

It has also been demonstrated that the raising of the lighting tower does not require more than five minutes.

In order to more fully try the apparatus under that point of view, on the 13th day of October it was transported to one of the squares of the city, whereon it was installed, and twenty minutes after the arrival of the two carriages the engine was under way, the tower raised, and the lighting in full operation.

In spite of the heavy rain, the light given the apparatus was sufficient to read a newspaper at a distance of fifty yards.

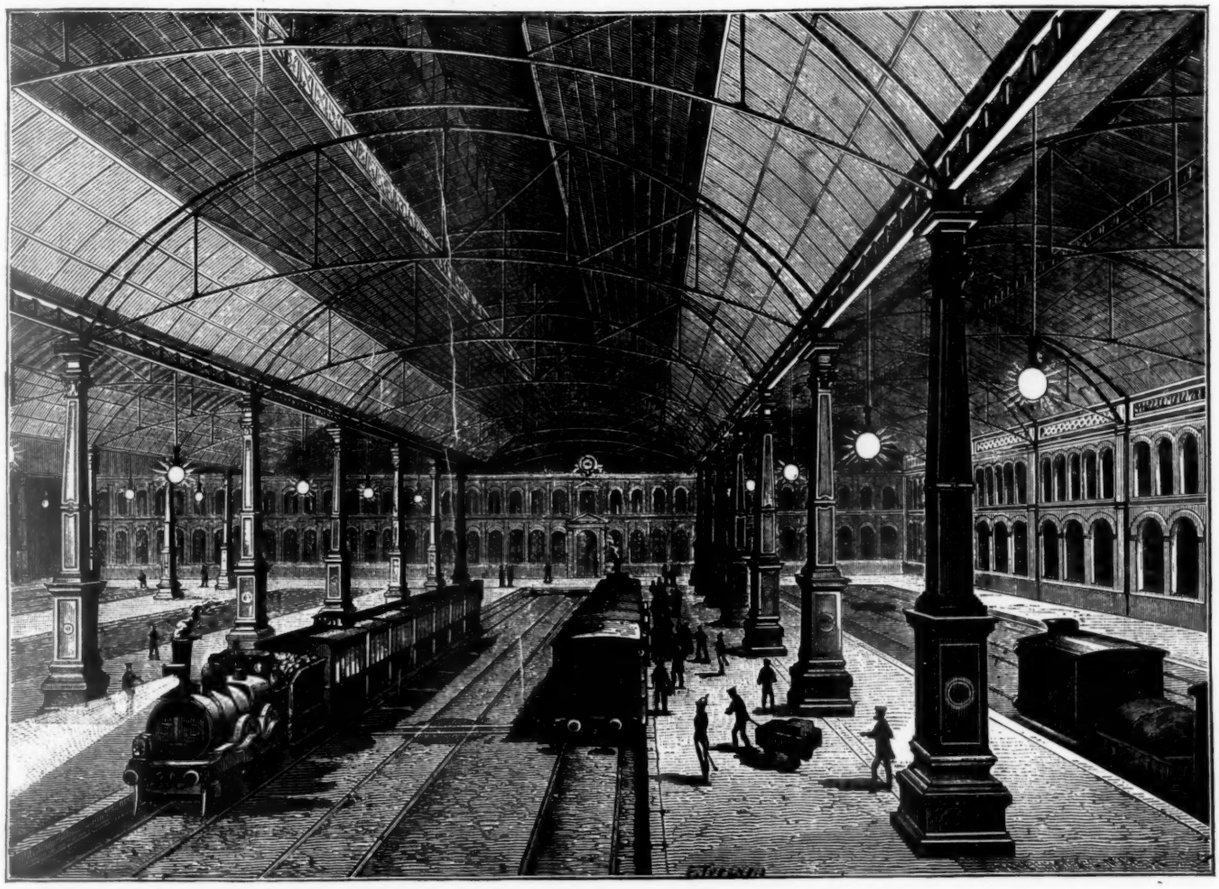

FIG. 101.—TRAIN LIGHTED WITH AN ELECTRIC LAMP LEAVING THE MUNICH DEPOT.

Finally, the apparatus seems to be very practical, and certainly will prove very serviceable for sundry military operations, such as the construction of earthworks, which must be executed with great rapidity, and which require working by day and night.

Another application of such machines on which we cannot lay too much stress, is their use in large cities for the repairing and cleaning of streets and sewers.

In Paris (we might say in New York), for sundry reasons of convenience and others, the works on streets and sewerage are generally done during the Summer, and a great many obstructions arise because the work must be done simultaneously at several places.

The use of such apparatuses as the one just above described in the works of the corporation, by permitting night work might reduce by one-half the duration of the work, and consequently the length of each local incumbrance. But, moreover, as with the night work the whole of the works could be executed in half as many days, in the same period of time one-half would be accomplished on one side and then the other half on the other side, and the general incumbrances of the streets in the city might be reduced to one-quarter the present duration, though each part should take the same length of time as now.

The circulation of the city being already very much impeded in ordinary time, every means at disposal should be taken advantage of to remove and diminish incumbrances, and night work with electric light would prove a very available means therefor. Undoubtedly the introduction of such rolling means of illumination would, *abinitio*, cause additional expenses, but they would soon be regained by the great acceleration of the execution of the work. For it is certain that any work executed continuously by gangs of workmen succeeding each other would be finished more rapidly than by being discontinued and resumed again every day.

Another special application of electric light is its use on the trains of the railways to light the tracks in advance of the locomotive.

On certain lines where the road is liable to get more easily incumbered, this kind of light is of a very great importance, and is apt to become very serviceable.

In America (in the West you may say), for instance, where the railroads travel immense solitudes occupied by herds of buffaloes, the advantages of the use of such lighting show themselves.

Moreover, a powerful focus placed at the head of a train of cars can be used to announce its approach, and may, by means of partial obstructions, form the base of a system of signals.

But anyone may conceive that, if an ordinary regulator now in use were placed on a locomotive, the trepidations of the train would soon be transmitted to the organs of the lamp, and would disturb its regular operation.

To permit the adaptation of the electric light on a locomotive, it has been necessary to have recourse to a regulator of special construction and so adapted that it will work regularly while under the influence of the trepidations just above mentioned.

The regulator exhibited by Messrs. Sedlaczek and Wilkulill was in such conditions. It is derived from a more ancient apparatus, constructed in 1856 by Messrs. Lacassagne and Thiers.

Figure 98 shows the lamp as it is fixed upon the locomotive in front, in a kind of lantern, which is grated so as to protect it from external shocks.

The dynamo-electric machine is placed on the upper part of the steam boiler, behind the smoke-stack, and worked directly by a special small steam power.

Figure 101 represents the locomotive at the head of a train in the Munich depot, lighted itself with electric light by means of the Siemens lamps.

On the 4th day of October, 1882, an experiment was made with the Sedlaczek's lamp, adjusted on the locomotive in the manner last above described, on the line from Munich to Solz, between Munich and Diesenhofen; the sky was clouded so that the lighting was produced wholly by the lamp alone, but otherwise the rain did somewhat weaken the luminous effect.

The lamp was burning very regularly, and no oscillations could be observed on account of the trepidations of the locomotive. In the curves the lamp turned automatically, so that the light was as good as in a straight line; at 250 yards from the lamp a newspaper could be easily read. At such a distance the light would stretch about 15 yards on each side of the roadway.

At a distance of 1,500 yards a design on white paper could yet be discerned, whilst the obscurity was complete without the lamp.

The light of the lamp was visible at four kilometers (2½ miles) at the least.

Two other trial trips—one to Pasing, the other to Sternberg—gave the same results.

The official report of the Munich Exhibition expresses the following opinion on those experiments:

The members of the commission have agreed on this point, that the lamp for locomotives behaved very well in regard to the lighting of the road and as a signal for the locomotive as well. Nevertheless, according to the reports of the guards placed along the line and directed to examine the signals of the train and the march of the cars, it was ascertained that the intensity of the light (about 4,000 candles) dazzled those guards so much that they were not able to make the observations prescribed by their rules. It is to be feared also that the horses traveling on the paths and roads along the railway might be frightened thereby, but no actual facts could be gathered on that point.

We must not forget, however, that some experiments had been made with the same lamp in 1881 on the Northern Railway from Paris to Dammartin, and Mr. Banderali, the engineer in charge of such experiments, did draw his conclusions (report) as follows:

The experiment has proved—

1. That the Sedlaczek's lamp did not get extinguished on the way at the ordinary speed of express trains.

(That precious quality would permit from this day to place a system of lighting of that kind on some relief cars to operate rapidly at night the picking up of the locomotives and cars and the repairs of the road.)

2. That the electric light did not in any way affect the visibility and distinctive colors of the signals.

3. That the engineers of the crossing trains were not dazzled, except when they looked persistently at the light, and then they still continued to perceive clearly the signal lights and luminous points separately; besides, the effects of such dazzling were not produced on them to such a degree as to hinder the perception of luminous signals, and even of dark objects when their own locomotives were provided with an electric light.

Accessorily with the apparatuses on trial, the works, buildings, high bridges, guard-houses, and water tanks were visible to the engineer at a distance of 500 yards. The road and cuts in front of the locomotive were perfectly lighted to a distance of 250 yards. An employe stationed on the road could see the objects lighted around him when the locomotive was yet 500 yards distant.

The inconvenience observed by the Munich commission in the dazzling of the guards posted along the road disappears after such observations made by Mr. Banderali, and the Sedlaczek-Wilkulill's lamp remains assuredly the most appropriate to the lighting of the road by the trains.

We must observe that the Schuckert's dynamo-electric machine, used to feed the Sedlaczek's lamp, was set into motion, not by a mechanical transmission taken from any of the axles of the locomotive, but by a special

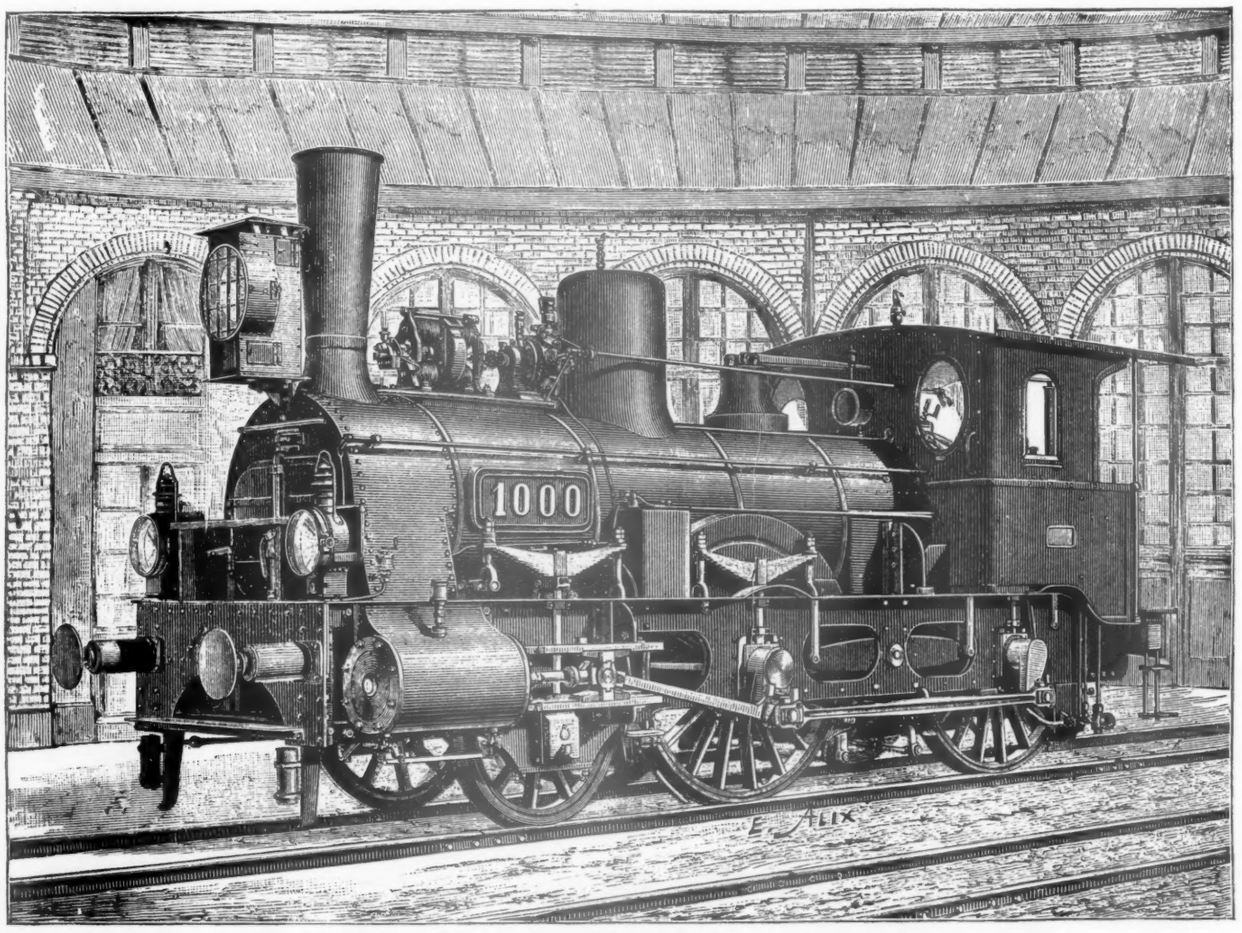

Fig. 98.—Locomotive with Sedlaczek's Lamp attached.

small steam power, with four cylinders, of the "Abraham's system," provided with a special mouth at the steam boiler.

In certain trials of the electric light on the trains, made especially at the company of the State, they dispensed with the accessory steam power, and set the dynamo-electric machine in motion directly by the means of one of the axles of the vehicle.

Then they fell into the inconvenience that the machine stopped working by the stopping of the train, and, in order to get a continuous light, they must have recourse to accumulators. That is not a very practical process.

The purpose was, it is true, not to obtain a powerful focus placed in front of the train, but small incandescence lamps intended for the lighting of the cars. Even in this case we would prefer the use of a special small steam power taking its steam directly from the boiler.

The accumulators must either be loaded during the running of the train by some machine getting its motion from such train, or else be loaded at the station and trans-shipped afterward to a wagon. They will always constitute a dead weight to carry, and cause a loss of power. Economy will decidedly be on the side of the direct use of steam from the boiler; and, since that process has proved successful for the lamp of the locomotive, it seems logical to apply the same to the electric lighting of the cars.—*La Lumière Electrique.*

Electric-Locomotive Head-Lights.

Our Consul-General at Vienna writes as follows regarding the experiments with the electric head-light, illustrated in the preceding article:

"Recent experiments with Sedlaczek's electric locomotive head-light on the Western Railway have been pronounced by the public prints so successful that I beg to transmit herewith a few items in regard thereto, which may prove of interest to our American specialists.

"The conception of illuminating the railroad track by means of an electric light attached to the head of the locomotive has long ceased to be a novelty in railroad engineering, while the advantages to be derived therefrom, if successfully accomplished, have furnished sufficient spur to urge inventors to the greatest possible researches and endeavors.

"Success, however, has been rendered very difficult from the fact that the oscillations and jars of the engine while in motion soon destroyed the delicate apparatus of the best electric lights known, and that a cheap and convenient method of generating the electric current not immediately dependent on the continuous movement of the locomotive proved difficult to obtain. In 1881 Mr. Sedlaczek, chief of the telegraph service at Leoben, in Austria, aided by Mr. Schukert, of Nurenberg, after six years of trial succeeded in obtaining, it is affirmed, these two great desiderata, first by adopting as generator a Gramme machine with a Brotherhood motor furnished with an automatic regulator, having likewise attached thereto a Schukert dynamo-electric machine. To obtain sufficient current required from 700 to 800 revolutions of the electric motor, demanding about three horse-power, being less than two per cent. of the force of the locomotive; and, second, the light was procured by a Sedlaczek lamp, invented specially for the purpose, having a force of 500 carcel jets. The electric machine was placed on the boiler, just behind the smoke-stack, and brought under the immediate control of the engineer.

"The first experiments took place in September of 1881, between Leoben and Judenburg, on the 'Kronprinz-Rudolf Bahn,' a distance of fifty kilometers, with great success, it is affirmed, to the end that the road for a kilometer before the locomotive was rendered light as day. The white signals were marvelously brought out upon the black background, and the lamps and lights appeared like yellowish points. The same experiments tried last October between Munich and Diesenhofen, of the Munich-Salzburg line, resulted in even greater success, as may be seen from the official certificate of the president and secretary of the commission of experts named by the Munich Electric Exhibition, a copy of whose translation accompanies this communication.

"Another opportunity of examination and experimentation will be afforded, doubtless, at the coming International Electric Exhibition which opens at Vienna on the 1st of September next.

"JAMES RILEY WEAVER,
Consul-General."

REPORT ON ELECTRIC LOCOMOTIVE HEAD-LIGHTS.

In the evening of October 4, 1882, between six and nine o'clock, a trial was made on the part of the railroad Munich-Deisenhofen (line from Munich to Salzburg) of the locomotive head-light exhibited by Schukert, on the system Sedlaczek.

The sky during the time the trial took place was completely overcast with clouds in such manner that the light of the lamp received no support from the moon or the stars; on the contrary, it is supposed that the rain which set in during the trial somewhat lessened the effect of brilliancy.

The locomotive lamp burned with perfect uniformity; disturbances caused by the

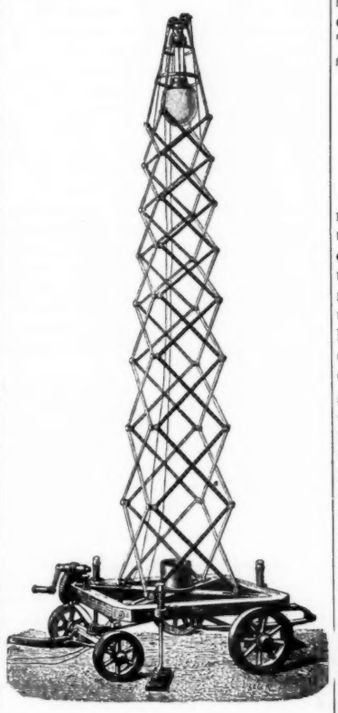

FIG. 97.

swaying to and fro of the locomotive could not be noticed. When on a curve the lamp turned of its own accord, thereby lighting the track just as effectually as on a straight line.

Objects in immediate proximity to the road, as well as the different forms and colors of the signals, could be plainly distinguished from the locomotive at a distance of 250 meters; at a distance above 250 meters the road was still sufficiently illuminated to recognize greater objects on the road.

On passing stations the position of the switches could be easily seen. At a distance of 250 meters from the lamp small print could be read without difficulty; at that distance about fifteen meters alongside both tracks of the road were yet lighted.

At a distance of 1,500 meters from the locomotive head-light a drawing on white paper could still be seen, while without that light there was perfect darkness.

The electric light of the lamp is visible at a distance of at least four kilometers.

The board of examiners for electro-technical trials at the Royal Crystal Palace in Munich:

The Secretary: OSKAR V. MEELLER.

The President: Dr. V. BEETZ.

Batteries and Dynamos Compared.

The *Centralblatt fur Electrotechnik* makes the following comparisons between batteries and dynamos:

A Bunsen element gives an E. M. F. of 1.9 volt, and has a resistance (the ordinary type of .20 meter) of .24 ohm. The greatest work is done when the external equals the internal resistance. The difference of potential is then .95 volt, and the current about 4 amperes. The useful work contained in an element, the return being 50 per cent., is therefore about 4 watts. Now, a dynamo which absorbs 1 horse-power gives about 460 watts; consequently, to replace this machine we must use 115 Bunsen elements. The cost of buying a dynamo of 1 horse-power is about the same as that of a battery of the same power. In point of fact, a Bunsen element of .20 meter in height costs about 5 francs, or 575 francs for the battery; a dynamo of 1 horse-power costs 500 to 625 francs. For more powerful dynamos the price is relatively much less; thus a 14-light Schuckert machine (for lamps), and giving off 5,000 watts useful energy, only costs 3,250 francs. A battery to do the same work would consist of 1,400 elements, costing 7,000 francs, or more than double, and would occupy a surface of about 40 square meters, whilst the dynamo would only take up 2 square metres. The battery would require 280 kilos. of sulphuric acid and 1,050 kilos of nitric acid.

The Vienna Electric Exhibition.

SOME NEW GERMAN ARC LAMPS AND THE AMERICAN BERNSTEIN LAMP.

VIENNA, August 24.—Our English-made machines are greatly inferior in their details to continental machines. Nothing can exceed the neatness and accuracy with which the Schuckert, the Ganz and the Schwerd machines are constructed, and this accounts, to a great extent, for the steadiness of the arc lamps of these firms. Every, even the slightest irregularity, in the movements of the dynamo causes a flickering of the lamp, and, given equally good carbons, used in lamps of equally good construction, the steadiness of the light will entirely depend upon the quality of the feeding dynamo. The steadiness of the arc light is one of the problems which is not entirely solved yet, but not the least doubt remains that the problem is one of perfection of details in the construction of machines, in the first place, and, secondly, of lamps. The Pilsen, the Schwerd, the Ganz, as well as the Siemens lamp, are coming nearer and nearer to the desired degree of steadiness. The original Pilsen lamp had two superposed solenoids, one of which was traversed by the main current and the second by a shunted current. For a given resistance of the arc a rod of conical shape, the leading feature of the Pilsen lamp, was kept in equilibrium by the two solenoids. A waste of the carbons brought about a corresponding increase in the resistance of the arc, and caused a descent of the upper or positive carbon, which in all Pilsen lamps is disectly fixed to the conical rod.

The Pilsen Company now also use lamps with one solenoid only. As in the older model, the conical rod carries the positive carbon, the lower negative carbon being fixed; the solenoid is strong enough to keep the rod in suspension for a certain illuminating power. Nothing simpler than this arrangement could be conceived. There is also a differential lamp, patented in 1882, with two parallel solenoids, above which two conical rods are suspended by means of a string passing over a pulley. When the arc is normal they are sucked in with equal strength by both solenoids; when a change of arc occurs, either one or the other solenoid acts more energetically on the conical rod, and thus the necessary balance for the maintenance of the arc is established. Forty-four Pilsen differential lamps and forty Brush lamps, placed on a gallery near the top of the rotunda, are the main factors for the illumination of that large hall. Four Schuckert dynamos supply the current for the differential lamps of 1,000–1,200 candles each. A sixty horse-power engine is used for driving the four machines, and also another ordinary Schuckert dynamo, which feeds twelve arc lamps in the Austrian section, in addition to a Schuckert compound machine for a number of incandescent lamps.

Messrs. Ganz & Co., of Buda-Pesth, show an excellent arc lamp, invented by Mr. Zipernowski. It is a lamp with one solenoid only, whose soft iron core is attached to a guiding frame, which carries a break for the clamping of a toothed wheel. The upper carbon is fastened to a rackwork, which gears in with the toothed wheel mentioned above. The current enters through the lower fixed carbon, which, under normal conditions, is kept apart from the upper one; the current, therefore, passes into the solenoid, the soft iron core is attracted, the guiding frame, which has the form of a parallelogram, is pulled down on one side, raised on the opposite side, which carries the brake, the toothed wheel and the rackwork are released, the positive carbon descends, and the arc is formed. The current now passes through the carbons until, through the waste of the carbons, the resistance becomes too great, when the former operation is repeated, and the positive carbon is again sufficiently lowered for the formation of the arc. The Ganz lamp, as will be seen, is of simple construction, and gives a steady light.

I have to mention one more arc lamp. It is the Schwerd lamp of Messrs. Schwerd & Co., of Carlsruhe. This is a lamp with one coarse and one fine wire solenoid. The carbons are actuated by a rackwork and clock train, which are controlled by the two solenoids. Several of these lamps are placed on the second gallery nearest to the top of the rotunda, and burn very steadily.

A most important advance in incandescent lighting is for the first time practically illustrated on a large scale at this exhibition. It is the possibility of turning on or off any number of incandescent lamps in one circuit without any special apparatus for the regulation of the current. This is done by means of the compound dynamos whose principle I have shortly described in my previous letter. By a simple manipulator, fastened to the wall near the machine, any number of incandescent lamps can be short-circuited. How important this is will be easily understood on reminding your readers that all the incandescent systems—Edison, Lane-Fox, Maxim and Swan—have special apparatus for this purpose, all based on the principle of introducing a greater or lesser re-istance into the circuit. These syecial apparatuses are uo longer necessary, and a great saving is thereby effected.

In all the rooms where the incandescent lamps are used, it struck me what a large number of lamps was required for lighting a comparatively small area—as, for instance, a smoking room about twelve feet square, fitted with thirty-six incandescent lights, presented a very dingy appearance. And this brings me to a new incandescent lamp, which, in my opinion, is destined to create a revolution in incandescent lighting. It is well known that for street lighting and illumination of large areas the incandescent lamp has proved a failure. The Bernstein lamp, exhibited by the Bernstein Electric Light Manufacturing Company, of Boston, Mass., supplies this want. The ordinary incandescent lamp has a very fine carbon filament, with a very small illuminating surface. The Bernstein lamp employs a hollow, semi-circular carbon cylinder, which is quite elastic, and has a comparatively large illuminating surface. The lamp resembles an ordinary incandescent lamp with a thicker carbon filament, but in its effects it differs materially from the ordinary type. With an electro-motive force of twenty-three volts and a current of seven amperes, it has an illuminating power of sixty-five candles; it stands midway between an incandescent and an arc lamp. As regards its durability, it has the great advantage of requiring but a low electro-motive force; the higher the electro-motive force the more rapid the disintegration of the carbon filament and the shorter the durability of the lamp.

The manufacturing process of the filament

is not published yet, because the patents have not been completed for the different countries. The low electro-motive force also permits the use of a very large number of lamps in series, and, therefore, the illumination of long distances by means of a very thin wire. This is of great importance, especially in street lighting, where the installation of copper conductors is a very serious item of expense. The Bernstein lamp is especially adapted for street lighting and isolated installations, and it is clear that a considerable saving can be effected by the use of a lamp which replaces four ordinary incandescent lamp.—*London Times.*

Interesting Facts Concerning Electric Light Tests at the Chicago Railway Exposition.

In our issue of July 5th, we gave the results of the electric-light competition at the Chicago Railway Exposition. Up to that time nothing had been done except to postpone the tests which should have taken place under the direct management of the exposition officials. This was disastrous, as the sequel will show and should never have been sanctioned, and perhaps would not if the exhibitors of railway appliances had been as industrious in getting their exhibits ready for inspection as the electric light companies had been. In the earlier days there was a good deal of chaos about the exposition, and under those circumstances the electric light companies consented to a compromise of the regular programme which was finally accepted and approved by the exposition managers, and a letter addressed to the secretary contained these points, briefly, will show:

"That expert tests of the electric light apparatus which we are exhibiting, to be made under rule 6, section 7, of the regulations of the exposition, and request that Prof. Henry Morton, of Stevens Institute of Technology, Hoboken, N. J., Prof. B. F. Thomas, of the University of Missouri, Prof. Chas. R. Cross, of the Massachusetts Institute of Technology, Boston, Mr. L. F. Lyne, of the *American Machinist*, and Prof. James Denton, of Stevens Institute, be appointed a jury for making such tests.

"That the jury be permitted to make the tests at any time before the 1st of September next, at such place in New York City or its immediate vicinity as may suit the convenience of the jury, and agree that such tests have the same force and effect as if made at the exposition.

"We agree that any exhibitor may submit to the jury duplicates of any of its apparatus actually exhibited, such duplicates to be of the same size and capacity and the same in construction as the exhibits.

"That the tests are to apply only to arc systems of ten or more lights, and incandescent systems of fifty or more lights.

"It is our desire that these tests be made in the most thorough and exhaustive manner with reference to determining the relative efficiency, safety, excellence of design and construction, and adaptation to practical use of the apparatus which we have exhibited; and we request that the jury be instructed to report not only the conclusions they may reach, but the full data upon which such conclusions are based, and that such report be substituted for the premiums already offered, which we hereby waive.

"We each agree to pay our proportional parts of the necessary expenses of making the tests."

This memorial was signed by all the companies but one, the "Brush," in the following mannner:

The U. S. Electric Lighting Co,
by L. E. Curtis, Sec.

Signed, subject to the approval of the Edison Electrical Light Co.

Western Edison Light Co.
by Geo. P. Bliss, Gen. Supt.
The Thomson-Houston Electric Co.,
by S. A. Barton, Treas.
The Fuller Electrical Co.,
by W. Seymour Geary, V. P. and Tr.

And it was presumed to be binding upon all, except the Edison company, whose New York managers were to approve of what their Western representatives desired.

This is where the matter stood when the exposition closed, and it is proper in the interest of the public for us to inquire what has become of the matter? September has now reached its second week, and nothing has been accomplished. To get the facts in the case a REVIEW reporter visited Professor Morton, at Stevens Institute, and learned that all who had been anxious for the tests had withdrawn except the United States Company.

The letter we quote will be interesting in showing the efforts made to have the tests complete, and also the history of the case:

STEVENS INSTITUTE OF TECHNOLOGY,
Hoboken, N. J., July 23d, 1883.

The committee appointed by the Chicago National Exhibition of Railway Appliances to test the electrical apparatus entered for competition at the exhibition by the following electric lighting companies: Edison Electric Light Company, Fuller Electric Light Company, United States Electric Light Company, American Electric Light Company, held a meeting of organization at the Stevens Institute of Technology on July 23d, 1883, and after electing Dr. Henry Morton as chairman of the committee, ordered the following communication sent to each of the electric companies mentioned above:

The committee have secured the use of adequate power and space for making tests of all sizes of light machines exhibited at Chicago, in the second floor of the building on the corner of Greene and Bay Streets, Jersey City, and have estimated that the cost of the entire test will not exceed $2,000. They hold themselves in readiness to proceed with the work according to the plan described below as soon as the chairman shall have been notified by each company of its willingness to subscribe its proportion of the cost of the experiments, *i. e.*, $500, or less.

GENERAL PLAN OF TESTS.

1. Each company is to send at once to the chairman of the committe a list of the sizes of machine, with dimensions of pulley speed and floor-space of each, which it desires to enter for test, and also a list of the number of lamps, safety devices, current regulators, &c., which it will desire to have erected and operated with each machine.

On receipt of this information the committee will promptly supply each company with a drawing of the floor-space to be occupied by its machines, and will invite each company to send forward its apparatus and erect it in accordance with the drawing. If possible all machines will be run off a line 2¼" shafting making 350 revolutions per minute.

Each company will erect its own plant, supply driving pulleys for main line, and all necessary belting, fixtures and labor; and the committee will in no way be responsible for the satisfactory working of a plant (beyond supplying the facilities shown by drawing and maintaining line shaft at 350 revolutions) until a written statement has been made by the company testifying that its apparatus is ready for test, and setting forth a definite statement of whatever measurements or results it specially desires to secure from the committee's work.

2. Measurements of driving power will be made by transmitting dynanometer. The intensity of the light will be determined relatively by comparison with each other if possible, and absolutely in candle power by reference to a standard gas jet, with a Sugg photometric apparatus. Measurements of current necessary to the determination of efficiency will be made in the usual manner, and every attempt will be made to give a definite practical valuation to whatever special detail or auxiliary device may be made the basis of a claim for excellence on the part of any company.

The results of all measurements made will be stated in every detail and with whatever elaborations may be desired including an exhaustive account of standardization of any or all of the instruments used by the committee, but the latter desire to have it distinctly understood that they do not consider it feasible, and that therefore they will not attempt to draw conclusions from the data resulting from the experiments seeking to decide which of the several competing companies manufacture the best machines for generat use.

Committee,—Henry Morton, chairman; C. S. Gross, L. F. Lyne, B. F. Thomas, J. E. Denton.

In reply to this the Edison Company have published their reason for not going into the competition substantially, as it was expected they would do by those who know their business methods.

The Fuller Company were "not satisfied," and it is just possible that they will never be fully satisfied with any test that might be made not under their own management.

The Thompson & Houston Company gave as their reasons for withdrawing from the agreement "that they are very busy making electric machinery for their constantly increasing trade, and to supply their fall business would absorb their whole time, and keep Professor Thompson so occupied as to prevent him giving the attention necessary to make a full test possible."

The United States Company alone signified their readiness to go on with the tests, and were anxious to have them completed at an early date. The committee were left in a quandary, and its chairman wrote to Secretary Talbot, stating the above results and asking him if the committee should make the tests as originally intended. Mr. Talbot's reply stated they should, and postponed the time when they must be completed to October 1st. In the meantime Professor Cross and Mr. Lynne had withdrawn from the committee, and Professor C. F. Brackett, of Princeton College, and Mr. Coleman Sellers, of Philadelphia, appointed to fill the vacancy. Finally, the tests are to be made under the exclusive charge of the reorganized committee in the United States works at Newark as early as practicable, and the results determined before October 1st.

This is the final outcome of what started last May with an extraordinary "boom," and the competitive tests which was to determine the superiority of the various systems of electric lighting dwindled from five at the Chicago Exposition in June to one only in September.

Boxed Electricity for Railways.

When M. Faure's method of storing electricity was first announced, we immediately suggested the utility of the system for lighting ships and houses and for moving street cars.

The suggestion was received with derision in some quarters, but the experiment recently made in Paris has demonstrated its value. An ordinary tram car was driven through the city, a distance of thirty miles, in three hours, Faure accumulators weighing about 2 tons supplying the motive power. The accumulators were placed under the seats of the car.

It is expected that the storage system will be employed in the substitution of electricity for horses on the street railways of Paris, and the change will effect a saving of ½ in the cost of motive power, it is said. As it is certain that the introduction of electricity on many railways of city streets in America is not far distant, the Paris experiment will be regarded with peculiar interest in New York. If the Faure system can be made available for common use it will remove many obstacles to the introduction of electricity to new and important uses.—*Mail & Exp.*

The Mission Street Railroad, San Francisco, Cal., to Run Cars by Electricity.

The Mission Street Railroad is about to experiment with electricity as a motive power on their road, and in the course of about a week a car will be run by the new power. Advantage has been taken of the discovery of Faure, the French scientist, with regard to the capacity of electricity for storage. To each car will be attached a dynamo machine, which is usually made use of in the generation of electricity. The machine consists of a cylinder which, being made to revolve rapidly in front of magnets, generates electricity, which is conducted off for use by wires. But the machine can also be used in another way, the process being reversed. If electricity is fed to the machine through the wires, the cylinder revolves. In the first instance, power is converted into electricity, and in the latter electricity is converted into power. The dynamo can thus be used by means of suitable attachments, to give motion to the wheels of a car, the electricity which is fed to it being kept in storage batteries, which occupy but a small space. These batteries are charged at the engine-house, where a steam engine is made to run a dynamo, which generates the electricity.

That cars can be moved by the means described there is little doubt.

Ireland's Electric Tramway.

DUBLIN, Sept. 16, 1883.—The first long electric tramway in the world was opened Friday, to run from the railway terminus at Portrush to the Giants' Causeway.

Portrush is a fashionable watering place on the northern coast of Ireland, five miles north of Coleraine, with which city it is connected by railway. From Portrush to the Giants' Causeway the country at each mile shows features of interest to the tourist. The road runs eastward along the coast past the White Rocks, with their fantastic caverns, and the picturesque ruins of Dunluce Castle, which rise from an insulated rock 100 feet above the sea, till it crosses the river Bush at a point two miles west of the Causeway. Here it bends northward and runs in a northeasterly direction to Causeway Head. The distance from Portrush to the Head is a little over seven miles.

The Caen Electric Exhibition.

The buildings of this interesting local exhibition in the old Normandy town are lighted by the incandescent electric light. M. Berjot exhibits his electric lamp in an improved form, and also a selection of Carré carbons, he being now associated with the house of Carré. The chief novelty of the exhibition is, however, an electric clock of M. Ledoux, in which a heavy vane added to the pendulum corrects by its mass the irregularities of the electro-magnetic action on the pendulum. There are also exhibited two electric dials, which repeat the hour given by a standard clock, and thus distribute the time much in the same way as the pneumatic clocks of Paris. We shall give full description of the exhibits later on.

Electric Tramcars.

Engineering says that a trial has been made at Paris of the Faure accumulators of the French Electrical Power Storage Company by the General Omnibus Company in propelling their cars. A car which plied along the Quai de la Conference from the Place de la Concorde to the Trocadéro was fitted up with 2½ tons of accumulators placed under the seats. The speed was about eleven miles per hour, and the trial was considered satisfactory. It was announced that the Omnibus Company had agreed to adopt the system on their cars to Versailles, but M. Geraldy has publicly criticised the matter very severely on the score of expense, and we are not yet aware whether the proposal will be carried out.

International Electrical Society.

An international society of electricians has been formed in Paris, France, under the presidency of the Minister of Posts and Telegraphs, the society to be universal, and not confined to professional electricians; but it is intended to include all persons who are interested in the advancement of electrical science. Correspondence may be addressed to the Organization Committee of the Society of Electricians, 99 Rue de Grenelle, Paris.

The Radial System of Lightning Conductors.

When we consider the concentrative and upward action of the electricity of the earth and the expansive action of that from the clouds, during a lightning discharge, also the failure of the lightning conductors as heretofore erected, it is quite evident that, in order to properly protect every part of a building, it is necessary to employ a radial or diffusive system of metallic conductors, which will enable the electricity concentrating in the earth from all directions to unite with that from the clouds by different paths about the building, thereby preventing an excessive flow of electricity over or through any portion of the building.

In Fig. 1 is shown the best radial or diffusive system of metallic conductors for the protection of a building, consisting of an air-terminal conductor, *G*, upon the ridge at or near each end of the building, a metal roof and a rain pipe, *A*, at or near each of the four corners of the building, metallically connected at *c* with a perforated iron pipe, *C*, leading into the earth in line with the gutter or drain, *I*. All the said conductors being electrically connected together, so that there will be four direct metallic paths from the lower end of each air-terminal conductor to the earth via the metal roof and the four rain-pipes. In order to more fully connect the air-terminal conductor, *G*, and the metal roof with the earth-terminal conductors, wire cables or stranded-wire conductors, *D* and *D'*, can be employed between them at or near each corner of the building, as shown.

Pipe *C* should be placed so that the waste water from a hydrant or pump in the vicinity of the building and the rain-water from the pipe, *A*, flowing along the gutter or drain, *I*, will readily enter it through its top opening, and passing through its lower and side openings, cause a suitable area of earth around and beneath it to become and remain moist during the whole year, and thereby effect an easy electrical path between the lower end of the pipe, *C*, and the subterranean water-bed.

During the beginning of a thunder-storm, the water from rain-pipe, *A*, flowing along the gutter, *I*, will soon fill the pipe cap, *C* and *H*, and flow in a body over them, and establish an electrical connection between the top of pipe, *C*, and the moist surface earth, which, together with the moist earth around and beneath the pipe, *C*, will constitute easy paths for the electricity of the clouds and earth, while quickly uniting.

It has generally been supposed that a metal roof and its rain-pipes were poor conductors of the electricity in a lightning discharge, owing to the thinness of the metal employed. They are, however, much better adapted for lightning protection, if well connected with the earth, than any other ordinary metallic conductors that can be employed. A rain-pipe four inches in diameter, or a band or course made of tin or terne plate, IXX brand, fourteen inches wide, has about the same quantity of metal per lineal foot as a round iron rod $\frac{3}{4}$ inch in diameter; and if its parts are well fitted or soldered together, it is fully three times better adapted as a lightning-conductor than the best copper conductor now erected, having much more capacity or scope for the expansive action of the electricity in a lightning discharge, and thereby able to greatly diminish its mechanical force.

When a lightning discharge passes through a solid rod $\frac{3}{4}$ inch in diameter, its expansive action is confined to a much smaller scope or space than when it passes through the same quantity of metal in the form of an ordinary tinned iron plate, or a hollow cylinder like a rain-pipe. In the case of the plate or rain-pipe, the electricity of great intensity can spread out and become electricity of lesser intensity.

That a metallic roof and its rain-pipes constitute a much better path for the electricity in lightning discharges than the metallic conductors heretofore employed, has been frequently demonstrated. On quite a number of occasions the ordinary lightning-conductors or rods erected upon buildings were struck at their air terminal or highest portions by lightning discharges; and at the points nearest to the metal roofs or rain-pipes the principal portion of the electricity left the regular conductors, and passed over to and down the metal roofs, rain-pipes, and rain-water flowing out of the lower ends to the earth, owing to the fact that the rain-pipes and the water flowing out of them furnished a better medium for the expansive action of the electricity, and an easier path to and from the earth than the regular lightning-conductors and the dry earth which surrounded their lower terminals. In a number of such cases the metal roofs and rain-pipes were partially melted at the points where the discharges entered and left them,

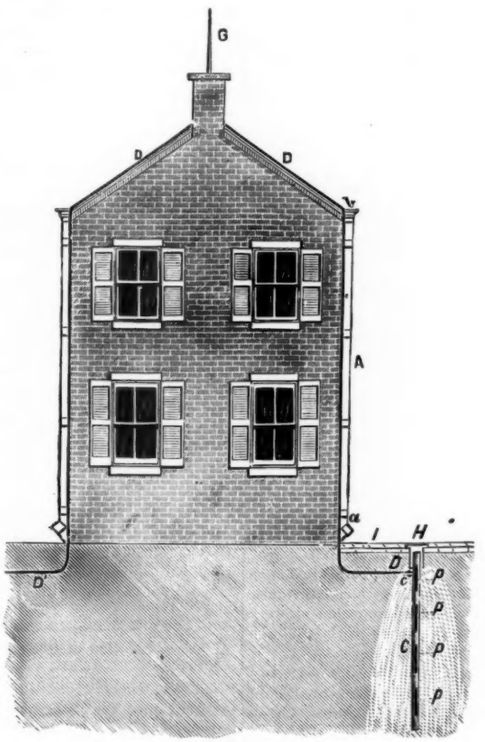

FIG. 1.

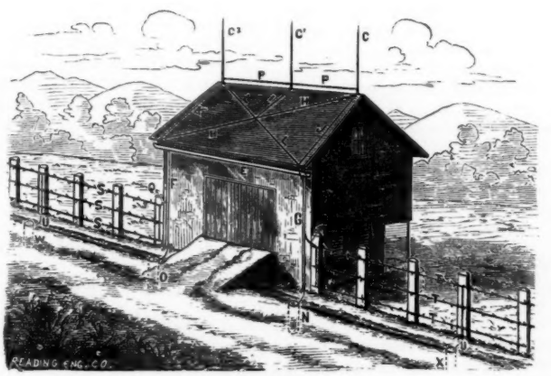

FIG. 2.

and the pavement and earth beneath the outlet of the pipes were torn up. By properly connecting the rain-pipes with the earth, all liability of damage to the metal roofs, rain-pipes, building, and pavement will be prevented.

Quite a number of other instances can be cited, where buildings furnished with metallic coverings upon their roofs, which are conected by metal rain-pipes with ordinary iron drains imbedded for some distance in the earth, have escaped damage from lightning discharges. The iron drain-pipes emptying into sewers in many cities cannot, however, always be considered as reliable earth terminals, owing to the short distance and depth they usually extend through the earth, and the dry condition thereof during the summer season.

On the other hand, quite a number of buildings having metal roofs and rain-pipes have been damaged and destroyed by heavy electrical discharges, and the inmates injured and killed, owing to the rain-pipes not having been connected with the earth.

When a metal roof and its rain-pipes are disconnected, or not well connected with the earth, they are, to a certain extent, like many of the worthless lightning-conductors now erected. They will receive a heavy lightning discharge, but not having proper earth terminals or connections by which the electricity of the clouds and earth can readily unite, the building is liable to be destroyed or damaged, and the inmates killed or injured.

PROTECTION OF BUILDINGS HAVING WOODEN, SLATE OR GRAVEL ROOFS.

A barn having a wooden roof can be properly protected by employing three air-terminal conductors connected together by wire cable or rod-conductor *P*, and also with two perforated iron pipes or earth-terminals, *O* and *N*, one at each corner, front and rear of barn, by means of wire cables, *F*, *G*, *H*, *I*, *J*, *K* and *L*, placed on the ontside of the roof and building as shown in Fig. 2, front and rear, thereby providing four short metallic paths from each air-terminal conductor to the four earth-tirminals, one near each corner of the barn. The perforated iron iron pipes, *O* and *N*, should be so located that the water from trough *E*, through its connecting rain-pipes, will flow in and over them, as fully shown in Fig. 1.

The barbed or plain fence wires, *S* and *T*, can also be used to facilitate the passage of the electricity from or to the earth during a lightning discharge, by connecting them with vertical conductors, *F* and *G*, by wires, cables, or other suitable conductors, *Q* and *R*, and also with the perforated iron pipes or earth-terminals, *W* and *X*, by wires, cables, or other suitable conductors, *U* and *V*.

Two earth-terminals can be employed in connection with each set of fence wires, *S* and *T*, placed at intervals of about sixty feet apart and from the barn. By employing long iron posts, placed in the earth for a depth of about ten feet at said intervals, in place of the wooden posts, the wires, *U*, *V*, and earth-terminals, *W*, *X*, could be dispensed with, at the said iron posts would then answer as earth-terminals.

In order to effectually prevent wooden, slate, and other roofs, steeples, towers, observatories, skylights, and other elevated projections above the roofs, from being damaged by lightning discharges, and also disfigured and damaged in applying lightning conductors thereto, it is necessary to employ bands of tin plate or galvanized sheet-iron, having the same quantity of metal per lineal foot as the rain-pipes extending from the eaves of the roofs to the earth, and place them in as short and direct lines as possible beneath the slate covering or wooden laths or rafters of the roof, etc., between the air-terminal conductors and the said rain-pipes or other suitable vertical conductors. The said bands and rain-pipes should, preferably, be made of tinned or galvanized iron plates about 36 inches long 14 inches wide, IXX brand, or No. 27 Wire gauge in thickness.—*From Spang's New and Revised Treatise on Lightning Protection.*

Electric Lights for Franklin Square.

At the meeting of the Council Committee on City Property, in Philadelphia, it was decided to report a resolution favoring the lighting of Franklin Square by electricity and awarding the contract to the Maxim Electric Light Company at sixty cents per lamp, last night. The number of lamps is not to exceed thirteen. In repairing the Square the gas-pipe system has been torn up, and according to Councilman Righter it would cost at least $800 to relay it, and even without this primary expense the gas would be several hundred dollars a year dearer than electric light.

The Thompson and Houston Electric Light Company of Canada.

This company was organized Nov. 29th, 1882, under charter from the Dominion Parliament, with an authorized capital of $1,000,000, $100,000 of which was subscribed and paid into the treasury. The official organization was as follows: F. E. Gilman, President; Wm. Angus, Vice-President; C. B. Cushing, Secretary, Treasurer and General Manager; Frederick Thomson, Electrician. The company own the Canadian patents of the well-known Thompson and Houston system, and was formed to promote the interests of, and to manufacture the machinery of this type for the installation of local electric lighting stations throughout the Dominion. Their factory has been in operation since July, and they are now turning out about two twelve light, and one twenty light dynamo machines, with lamps complete, a week. This factory was built at a cost of $25,000, and is the only one used exclusively for making electric light machinery in Canada. The company have a large number of lights burning in several of the principal streets and stores in Montreal, and local companies are forming in Quebec, Toronto, St. Johns, New Brunswick, and other Canadian cities to open this excellent system of lighting.

Experiments are being made with an Edison electric light generator in Jopilla de Juarez, Morelos, Mexico, with the view of lighting that town with the incandescent rays.

Telephonic.

(For the Electrical Review.)

Buffalo, N. Y., Sept. 10, 1883.

Notwithstanding the ferocity and untamability denoted by its name, Buffalo is not by any means a wild city.

Not at the present time can an Alexander Selkirk walk its streets and despairingly declaim:

"Oh! Solitude, where are the charms that sages have seen in thy face;" for, to speak the truth, there is no solitude in Buffalo, save that which is experienced by the traveler who knows not a single soul, and which is referred to by somebody in the sentence:

"There is no loneliness so intense as that of a person alone and without a friend in the streets of a great city."

Such a loneliness as this, however, need never be the experience of a telephone man in the United States, for the telephone has instituted a new order of free masonry, and has a ready-made lodge in every city throughout the country where the initiated may find friends and brothers ready to take him by the hand; to aid him in every way; in short, to welcome the coming and speed the parting guest.

This is most emphatically the case in Buffalo where hospitality is the rule.

I don't know the why or wherefore of the singular name of Buffalo, unless it may be because there are no buffaloes within 1,400 miles of the city. This is the only reason that occurs to me at present.

I don't know that I should have speculated upon such a thing at all, but that an interesting little 5-year-old boy of my acquaintance when told that his father was at Buffalo, inquired earnestly: "Is Buffalo a very wild place?"

As to location, the city lies at the extreme eastern end of Lake Erie, just at the head of the Niagara River, at the western end of the Erie Canal and of the New York Central Railroad.

It is a great railroad center, some twelve railroads coming in to the city, while two or three others are on the way.

At the present time Buffalo is experiencing a steady growth, and has an estimated population of about 200,000.

Telephonically also, this city of Northwestern New York is important. It is the headquarters of the Bell Telephone Company of Buffalo, N. Y., an organization controlling the telephone interests of about six counties in this corner of the State, and operating quite a number of exchanges, the principal ones being Buffalo, Rochester and Lockport.

The Buffalo exchange has from its outset been a successful one, albeit it has had to fight many adverse influences. One of the bitterest fights between the Western Union and Bell Telephone interests was here carried on. Yet, although the former had the start, it never gained any solid advantage.

The present officers of the company are as follows:

President—Henry M. Watson.
Vice-President—James McCredie.
Secretary and Treasurer—H. C. Palmer.
General Manager—Samuel H. Cowles.

Walton Smith, long and favorably known in telegraphic circles, fills the office of Superintendent, and devotes his energies to the care of construction and maintenance of the plant, besides keeping a close supervision over the operating department.

The Buffalo Exchange is noted as being the champion of the toll or European plan system of telephonic communication in which a certain rental is paid for the telephone, and a small charge made also for every communication. The plan seems to worm satisfactorily here, although its general applicability may be doubted.

The operating room or central office is a large upper room, lined all up one side with fifty line sections of the Gilliland switchboard.

These switches have already turned the corner at one end, and will apparently soon have to make the return trip down the other side of the room.

At the present time there are thirteen of these sections in use, the operators, of course, being young ladies.

The consideration with which the operators of the Buffalo Exchange are treated is worthy of special mention.

The regular force comes on at 7:30 A. M and leave at 6 P. M.—1½ hour being allowed for dinner. During this noon recess a relief of five other operators comes on duty, appearing also at 6 P. M. and staying until relieved for the night, which may be at any time between 8 and 10, according to the state of the business. Each operator is allowed a summer vacation with pay, the extent of which depends in a measure upon themselves. As the toll system is employed here a certain amount of clerical labor in making out the check tickets devolves upon each operator, and, of course, occasional errors are made; these errors are, however, carefully noted and credited to the perpetrators; and the operator making the clearest record during the year has the longest vacation, and so on.

The Edison transmitter is invariably used at the switchboard.

Six hundred and thirty-six lines enter the exchange, of which two only are battery lines.

A special feature in this office is a printing telegraph instrument of the Gold and Stock Telegraph Company, which stands in one corner of the room and prints the base-ball scores with other sporting intelligence. This is repeated to such subscribers as are sufficiently interested to pay a small fee charged therefor.

Five long lines leave the Buffalo office, two of which extend to Rochester, one over a Northern route through Lockport and Albion and one on a Southerly line via Batavia.

One line reaches to Akron, N. Y., one to Tonawanda and one to Niagara Falls.

The Rochester lines are both fitted with the Bliss clock attachment, which individualizes each station, and these attachments work well and save much useless ringing at each place.

Only four cables have as yet been suspended in the air, and these are all of Phillips manufacture, and comprise 25 wires each.

The outside construction at Buffalo is very solid, and reflects much credit upon its constructors Nearly all the lines are on good stout poles, and the new wire which is now being put up is No. 14" steel.

Some distance from the main central office there is a branch office known as the second division.

Here we find six 50-line boards nearly filled up.

All told there are about 1,210 subscribers.

Some of the ladies who manipulate the switchboards have been in the office from a period anterior to the Niagara Convention.

The workings of this exchange are most interesting, and everyone interested in telephony should stop off at Buffalo when passing through.

For the benefit of that portion of the traveling public who like nothing so well as being gulled, it may be well to state that there are more ticket scalpers to the square inch in Buffalo than in any place East of Kansas City.

Buffalo has a wonderful number of cigar stores, and one or two curiosities in the matter of storekeepers names. I noticed, for instance, one firm with the sign over its door of Peter Paul & Bro.; while not far away is the firm of Messrs. Irish & English—the oddity of which combination is emphasized by the fact that Irish is an Englishman and English an Irishman. T. D. L.

Mr. Robert Morton, superintendent of the Philadelphia Telephone Company, has resigned and accepted a position as superintendent with the Central Union Telephone Company of Chicago. Mr. Morton is a thorough and energetic telephone man, and will be appreciated in his new field.

National Telephone Exchange Association.

Secretary's Office,
132 La Salle Street, Chicago,
September 10, 1883.

The fifth meeting of the National Telephone Exchange Association will take place at the Gibson House, Cincinnati, commencing Tuesday, October 16, at 10 o'clock A. M.

The Local Committee of Arrangements consists of Mr. E. V. Cherry, of the Standard Electrical Works, and Mr. G. N. Stone, of the City and Suburban Telegraph Association, both of Cincinnati, Ohio. Inquiries for room and space for exhibits, addressed to either of them, will receive prompt attention.

Prices for hotel accommodation will be $4 per day for first-floor rooms, and $3 a day for rooms higher up. It is found impossible to make general arrangements for reduced rates of transportation, owing to the fact that no exact information can be given the railroad agents as to how many are coming from any given direction. Members coming from points like New York, Chicago, etc., can club together and arrange for reduced rates at their local ticket offices.

It is earnestly desired that members should prepare for the convention individual papers on subjects connected with the telephone business to which they may have given special study. The reports of the committees necessarily pass over a great deal of valuable information, which may be brought out in this way. The Executive Committee therefore beg that individual members will not hesitate to come forward with contributions of this character, for the reading of which ample time will be allotted.

C. N. Fay,
Sec'y National Telephone Exchange Association.

Note.—The secretary has on hand complete sets of the Reports of Proceedings of the four former meetings of the association, which will be sent post-paid to any address, on receipt of the sum of two dollars ($2) per set.

Election of Officers.

The stockholders of the Missouri and Kansas and United Telephone companies met at the office of Secretary Crandall, in the Wales Building, Kansas City, September 8th, and elected the following board of directors for both companies, all the stock ($1,700,000) being represented: E. T. Gilliland, Indianapolis; Geo. L. Phillips, Chicago; Theo. N. Vail, Boston; J. R. Mulvane, Topeka; W. B. Clarke, Junction City; C. Selden, St. Louis; J. H. Corby, St. Joe, and J. M. Coburn and C. D. Crandall, Kansas City. The directors then elected the following officers of both companies: W. B. Clarke, president; J. R. Mulvane, vice-president; C. D. Crandall, secretary and treasurer.

Executive Committee—W. B. Clarke, C. Selden, J. R. Mulvane, and J. A. Corby.

Tester's Telephone.

M. Tester, of the French telegraph administration, has devised a magnetic telephone which has given good results. It resembles a watch, with the glass replaced by an ebonite mouthpiece. The iron plate vibrates before a double magnetic ring, having projections like the indented edges of two concentric cups. The magnetic polarity is different in the two rings, one ring presenting north, and the other south poles. Each ring is provided with a fine coil of wire, and the entire magnetic field is traversed by the current.

A New Telephone.

On Sept. 15th application was made for a charter for the Citizens Telephone Company, which is composed of Mr. Thwing, Norman May, Robert McGonigle, Mr. Pollock, W. B. Mustin, Mr. Beal, Geo. B. Hill, John C. Newmyer and T. T. Keckler. The capital stock will be $200,000 divided into shares of $50 each, The company will build its own lines in nine counties in Western Pennsylvania, wherein they have applied for charters. These counties are Allegheny, Beaver, Westmoreland, Fayette, Greene, Armstrong, Indiana, Washington and Butler.—*Ex*

The lines of the spiral telephone wire are to be extended at once through Lowell to Concord, N. H., in all some ninety miles, over the last sixty of which no service can be obtained now by the old wires, and will then probably extend to one hundred and fifty miles or more in all. These wires are strung on the poles of the American Bell, and follow among from three to forty-five wires on the same poles and the same cross-arms, and are subject to all the usual drawbacks.

The Bell Telephone Company has declared a dividend of $3 per share, payable October 15. The transfer books will be closed from October 1 to October 10.

In telephone stocks, Bell is a little stronger, with sales of 140 shares. The dividend which has been declared would, under ordinary circumstances, have sent the stock up, but the feeling about it now seems to be only one of disappointment that it was not larger.

"Yes," said Mrs. Uppertenn, "I know the telephone is a great convenience; but I shall have it taken out of the house. The things are becoming so dreadfully common, you know."

A Lowell gentleman writes: "I noticed in news columns of Monday a letter dated Lowell and signed Gardner Pierce, which reflects quite severely on the telephone companies. Being quite a large stockholder in the various companies, I made some inquiries regarding Mr. Pierce, but could find no such party in Lowell, and the telephone companies have no record of any such a stockholder on their books, and I feel confident I can maintain the assertion that the writer of the letter referred to is not a holder of any telephone stock, as his letter is a proof that he is trying to depreciate instead of advance the value of them."

The Telephone Controversy.

Washington, Sept. 17.—Counsel for Alexander Graham Bell have filed with the Commissioner of Patents an appeal from the decision of the Examiner of patent interferences in "Case G" of the celebrated telephone controversy. By that decision priority of invention of the telephonic receiver was awarded to J. W. McDonough. His claim, as allowed by the Examiner, was for "a telephonic receiver consisting of the combination in an electric circuit of a magnet and a diaphragm supported and arranged in close proximity thereto, whereby sounds thrown upon the line may be reproduced accurately as to pitch and quality." The appeal just filed will carry the case before the Board of Examiners-in-Chief for action.

Telephonic Electricity.

Chicago, Sept. 14.

The philosopher and eminent electrician, Professor Faraday, once said: "There was a time when I thought I knew something about the matter, but the longer I live, and the more carefully I study the subject, the more convinced I am of my total ignorance of the nature of electricity."

The telephones in use are only a means by which the sense of hearing is quickened, and the peculiar manner of applying the means by which the conversation is conducted, is much thought of by those who have given the subject serious attention. It would appear amusing to see a person take a piece of iron or steel about the size of an ordinary lead-pencil, and connected by conducting wires to a telegraph line, and place one end of the iron to the ear, and by such a simple process hold conversation with another person miles apart. Yet this is done every time a receiving telephone is placed to the ear. The magnet of the telephone is only a piece of steel magnetized, and when placed to the ear magnetizes the conducting organs of hearing within the ear of the listener. The life particles in the ear are magnetically affected by the near approach of the end of the magnetized iron in the

"phone," and thus blending with the magnetism of the iron of the telephone the speaker and the listener become as one person. When the experiment is further extended the fact may be fully demonstrated that the ear and not the "phone" does the receiving. The telephone itself does not contain or transmit the sound of the human voice.—HENRY C. STRONG.

Telephone Interests in Mexico.

Mexican telephone has advanced on its improved prospects. Six weeks ago everything regarding the company was in doubt, and a debt of some $32,000 existed. To-day $25,000 of that debt has been cancelled, leaving a balance not yet matured, but which will be met at maturity. To-day, also, the first royalty received from any of the subcompanies came to hand. To-day, furthermore, the manager shipped 300 sets of instruments to the parent company, 50 sets to the Mexican Peninsula, and 40 sets to the Chihuahua subordinate companies.

The Guadalajara company earned in June $791.14, all of which was put into expenses and plant, and no call made on the treasury of the parent company. The 25,000 shares of new stock have been issued and paid for, and the company now has a good working balance in the treasury. The general manager says they will promote the business as fast as possible.

Bourseul's Claims to the Invention of the Telephone.

A correspondent sends us the following interesting communication: "After the able manner in which Professor S P. Thompson has put forward the claims of Reis as the first and true inventor of the telephone, as opposed to those of Bell, it is rather surprising to suddenly come across a publication to the effect that the labors of both these men have been anticipated by one Charles Bourseul, in 1854. The publication in question is a lecture delivered by Captain Holthof in April, 1881, to the Electrical Society of Frankfort, and will be found on page 48 of that society's *Journal*, which, for some reason unknown, has only just appeared.

"The following passage, quoted from the lecture, will be read with interest: 'If we agree to call the true inventor that man who is the first to conceive clearly a new idea, and who tells us how this idea can be carried out in practice, then the telephone was invented in 1854 by Charles Bourseul, a Frenchman, and about that time a soldier in the African army.' We learn further from the same source that the invention had been communicated in 1854 to the French Academy, and that more or less detailed descriptions of it went the round of the German papers of that period. Notable in this regard is one article which appeared on the 28th September, 1854, in the *Didaskalia*, a supplementary paper to the *Frankfurter Journal*, which sets forth the very gist of the invention so clearly that, in spite of its ancient date, a short abstract from this paper may be interesting to our readers:

"'An electric current passing through a wire transforms a piece of soft iron into a magnet. If the current ceases, the magnetism also ceases. This electro-magnet can be made to alternately attract and release a movable plate, which in its to-and-fro movement produces the conventional telegraphic signals. Now, it is also known that all sounds which reach our ear are produced by vibrations in the air, and that the infinite variety of sounds depends solely on the speed and magnitude of these sound waves. If, now, a metal disk could be invented which would be flexible enough to reproduce all the sound waves transmitted to it by the air, and if that disk could be connected to an electric circuit—in such a way that in conformity with the vibration of the air it would start and interrupt the current—then it would also be possible to cause a similarly constructed metal disk, in electrical connection with the first, to repeat all the movements of it, and the effect would be the same as if one had spoken directly against this second disk—that is to say, the ear would be affected in the same manner as if it heard the speech directly through the first metal diaphragm.'

"Captain Holthof considers it very astonishing that Reis did not know of Bourseul's invention, but infers this to be the case, as otherwise he would have introduced at once the second diaphragm. As regards Bell, the lecturer thinks it 'downright incredible' that Bourseul's labors should not have been known to him. In conclusion, Holthof suggests that Bourseul should be recognized as the father of the telephone." We may add that the claims of Bourseul in this direction have had a most notable advocate in M. le Comte du Moncel, the well known and prolific writer on electrical subjects.—*London Electrician.*

The Telephone.

The records of the six telephone companies under the management of Lowell gentlemen (viz.: National Bell of Maine, Boston and Northern, Bay State, Suburban, Union, and Granite State) for August show a handsome increase over that of the previous month. The total number of subscribers on the 1st day of September was 12,676. Of all the cities Lowell leads in the number of subscribers, there being on the day above named 1,007. Portland and Worcester have about the same, the former 829, the latter 869. Springfield has 637, Lawrence 291. According to the report before us, the telephone lines through the companies named are extended into about one hundred and thirty towns and cities, but the names of many towns are evidently omitted from the list. One-half, if not more, of the places named are readily connected with Lowell subscribers if so required, largely superseding the telegraph. The extra-territorial business for July was 22,231 messages, while that for August was 25,783. During the last month the business in every direction was larger than ever before, and it is likely to be still larger during the present month.

There are now 250 telephones in the Lewiston and Auburn, Me., circuit. At the rate of about ten thousand dollars a year, these two cities are now paying for the telephone conveniences. The telephone is one of the greatest of economizers of errand-boy and shoe-leather in general. Business got along without the telephone when it didn't know the telephone, just as it got on without the telegraph, the railway and the steamboat before these came in. But with every new invention facilitating exchange and traffic, there is more business, more satisfactory and comfortable business and a better bringing of the world together. The probability is, these two cities get the value of their money, telephonically speaking.

Telegraph Companies.

The directors of the American Rapid Telegraph Company met at Boston last week and filled four vacancies in the board by the election of Messrs. A. W. Dimock, G. S. Mott, John R. Hagerman and G. Putnam Smith, all directors of the Bankers and Merchants' Company. Mr. Dimock and his associates in the latter company have purchased a controlling interest in the American Rapid. Several weeks ago they purchased a controlling interest in the Southern, and all three will be managed as one system. Mr. Dimock will be president, Mr. J. G. Case, treasurer and secretary, and Mr. G. S. Mott, general superintendent of all three companies. It is probable that there will be an actual consolidation in the near future. The three lines thus joined make a system extending from Boston to Charleston, and from New York to Cleveland. The Southern has already contracted for an extension to New Orleans, and the work is now under way. The stockholders of the American Rapid on Thursday voted to increase the capital $3,000,000, so as to extend its lines from Cleveland to Chicago and St. Louis. The Bankers and Merchants' is building six additional wires between New York and Washington. It already has ten lines between these points.

Introduction of the American Duplex System in South America.

VALPARAISO *via* GALVESTON, Sept. 20.—The introduction of the American duplex system on the telegraph lines between Valparaiso and places in Uruguay and Brazil will insure the speedy transmission of messages via Galveston.

New Telephone Company.

The Overland Telephone Company are putting out telephones in all parts of the State. They hold exclusive license for the entire State, and are appointing agents and disposing of territory to sub-companies that are being formed for the establishment of local exchanges Their instruments are handsomely gotten up, and are superior in many respects to those in common use. Mr. E. W. Smith, who until recently was with the Bell Telephone Compony, has accepted the position of superintendent, and entered upon his duties at their office, 784 Broad street.—*Newark Sunday Call.*

A New Telegraph Soldering Iron.

A very convenient soldering iron for the use of linemen in erecting or repairing telegraph or telephone lines has been devised by Mr. J. O. Fry, of the National Telephone Company, Nottingham. The bit is hollowed out into a well for receiving a pool of liquid solder, a groove being formed to carry off excess into a chamber within the handle. The joint to be soldered is laid in this well.

The iron is so constructed that new bits can readily replace the old, while the flat side of the iron is used in the ordinary way. By its means eight or more joints can be soldered at one time.

Telephone service has been opened between Yecapixtla and Ocultuco, Morelos, Mexico.

Military Telegraphists' Reunion.

CHICAGO, Sept. 19.—A reunion of the Society of the United States Military Telegraph Corps was begun here to-day. The morning session was devoted to routine business. This evening a banquet was held at the Grand Pacific Hotel in conjunction with veteran civil telegraphers. To-morrow forenoon another business meeting will be held, at which, it is understood, action will be taken looking to securing the recognition of this branch of the service during the war from Congress.

Twenty of the women telegraphers who remain unemployed at New York, met at Clarendon Hall Monday, and received from the Telegraphers' Brotherhood money equal to the wages they would have earned if at work.

The Telegraph in Siam.

Gen. Holdeman, our Minister to Siam, writes to the postoffice department that the first telegraph line ever put in operation in that country, extending from Bangkok to Saigon, was formally opened to the public on the 16th of last July. Two other projected lines are nearly completed. A postal service is soon to be established in Siam under government control. Gen. Holdeman forwards several well executed specimens of the first issue of postage-stamps and cards. There are five stamps of different colors and denominations, from one-half cent to fifteen cents, each bearing the portrait of the king of Siam.

The Erie Telegraph and Telephone Company, notwithstanding the exceedingly warm weather, especially in the South, increased as follows, during August: Northwestern division 160, Southwestern division 135, Cleveland 49—total, 344. Several new exchanges are in progress of construction in the southwest and northwest divisions.

A telegram from Brussels, dated August 30, says:—"The experiments made for establishing telephonic communication between Brussels and Antwerp by means of the existing telegraph wires, according to the system of M. van Rysselberghe, of the Brussels Observatory, have been perfectly successful."

The certificate of incorporation of the International and Northern Telegraph Company was filed in the County Clerk's office on Thursday last. The new company proposes to connect all the principal cities of the United States and Canada. Its capital stock is $5,000,000, divided into 50,000 shares. Its corporators and the number of shares held by each of them are: A. D. Remington, Watertown, N. Y., 10 shares; A. W. Clark, Watertown, 10; Orren G. Staples, Watertown, 10; C. Meyer, New York, 10; C. W. Town, New York, 10; J. F. Walton, Alexandria Bay, N. Y., 10; William H. Kimball, Canton, N. Y., 10; M. C. Martin, New Brunswick, N. J., 10; F. T. Story, Watertown, 10; James H. Searles, Rome, N. Y., 1; E. B. Bulkley, Watertown, 5; N. S. Gilbert, Watertown, 10; Isaac Munson, Watertown, 10; W. H. Breeden, New York, 10; P. C. Onderdonk, New York, 10.

We understand that Major Geo. W. LaRue is making a short visit to the United States, and is now in the West. It is also stated that he is about to form a new partnership, this time for life, with one of Ohio's fair daughters.

The telegraph office at Cottage City is closed, but telephone messages are sent over the cable. Singularly, the cable seems better adapted to the uses of the telephone than for sending messages by telegraph. Great difficulty has been experienced this Summer in transmitting dispatches, but telephone messages are heard with distinctness.

The Telegraph Line to Brazil.

PRESIDENT ARTHUR SALUTES THE EMPEROR AND HIS PEOPLE.

The formal opening of the Central and South American Telegraph Company's lines to Brazil, connections with the United States being made via Galveston, Tex., took place on the 21st inst.

The following message was sent over the wires by President Arthur to the Emperor of Brazil:

"The President and Government of the United States salute the Emperor and people of Brazil through the new channel of direct communication between the two countries this day opened via Galveston and Valparaiso, and see in these multiplied links of intercourse the assurance that the happy relations between them will continue and increase to the material benefit of both peoples and countries."

The Chamber of Commerce sent the following:

"The Chamber of Commerce of the State of New York congratulate the Commercial Association of the City of Rio de Janeiro on the completion of telepraphic communication between the Empire of Brazil and the United States via Galveston, and cherishes the hope that the increased facilities to commercial intercourse will bind the two nations in closer ties of friendship."

A telegraph office has been opened in Chavarria, Durango, Mexico.

Work on the telegraph line between Xicotencatl and Tampico, Mexico, has been commenced.

VALPARAISO, CHILI, Sept. 20, via Galveston.—The Chamber of Deputies has conceded permission to Messrs. Bolton and Dittbron to construct telegraph lines in the northern and southern portions of the Republic.

The meetings of the New York Electrical Society will be resumed on Friday evening, October 5th. The lecturer of the evening has not yet been definitely decided upon, but it will probably be either Professor Chandler of Columbia College, or Mr. George d'Infreville, Electrician of the Western Union.

The New Haven Gas Light Company have, without solicitation on the part of the citizens, reduced the price of gas from $2.25 per thousand feet to $2. Beware!

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Those desiring to recommend their goods can do so to any extent in our advertising columns, but we will not publish for pay anything of that nature in our reading columns.

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The Telephone Convention.

The fifth meeting of the National Telephone Exchange Association will take place in Cincinnati, Ohio, commencing October 16, 1883.

It has been customary to call these meetings "conventions," and that term implying as it does, "an assembly of delegates or representatives to accomplish some specific object, civil, political or ecclesiastical," seems to be as suitable a conventional appellation as can be found, if to the foregoing catagory we add the word "electrical."

It is undoubtedly needless that we should attempt to excite any enthusiasm among telephone managers with reference to this most important meeting; and all therefore that we desire is to call the attention of those to whom it may concern to the date and location of the next meeting.

The object of the association meetings as clearly stated in the second article of the constitution is to collect, preserve and protect all matters of importance to telephone interests.

The numerous standing committees of former years have been consolidated and there are now but five.

These are:

1st. Legislation.

2d. Central Office Systems and Exchange Statistics.

3d. Construction and Supplies.

4th. Cables. Subterranean Sytems and Electrical Disturbances.

5th. Exchange Rates.

The members of the Committee on Legislation are.

M. F. Tyler, of New Haven, Conn.; F. G. Wood, of Utica, Col., and W. H. Eckert, of New York.

Those of the Committee on Central Office Systems, &c.:

W. D. Sargent, Brooklyn; W. S. Reyburn, Peoria; F. O. Vaille, Denver.

On the third committee—that on Construction and Supplies—are the following names:

W. A. Jackson, Detroit; J. E. Zeublin, Philadelphia; H. N. Gifford, Louisville; C. H. Haskins, Milwaukee, Wis.; A. B. Uline, Albany.

The fourth committee as appointed comprises the following gentlemen:

J. P. Davis, New York; Thomas D. Lockwood, Boston; Henry Metzger, Pittsburgh; John I. Sabine, San Francisco; C. E. Chinnock, New York.

The fifth and last committee consists of the well-known names:

Geo. F. Durant, St. Louis; Samuel Ivers, New Bedford; F. A. Newell, Bradford, Pa.; S. H. Cowles, Buffalo; G. N. Stone, Cincinnati.

It is evident to anyone who has been a regular attendant upon the association meetings that the value of the able reports which have been submitted would have been greatly enhanced by a full and free discussion. As it is, the greatest advantages which have been reaped from the meetings have been most certainly due more to the interchange of thought in private conversation than to the reports of committees, and this may be truly ascribed to the dearth of discussion.

If now the representatives of the telephone interests of the United States could for a few days by a superhuman effort throw off their inherent shyness and talk upon the various subjects brought up, the gain would be incalculable.

It is probable from the central position of Cincinnati that a considerable number of delegates will be present. We understand that the general headquarters will be located at the Gibson House.

Technical Education Abroad.

Few subjects should more readily commend themselves to the attention of our educational authorities than that of industrial schools; for if hand labor is honorable, the workman should be so well instructed in the theory of his trade as to assist him toward becoming a master workman.

Mr. Edward Robbins has presented to the British Society of Arts the results of the inquiries he has made into the causes of the differences in the degree in which different countries have profited from technical education. The clew is not found in differences in primary education; but when the provisions made in foreign colleges for higher education are examined, something will be found in them so superior to anything in England as to afford a lesson of value.

The intellectual and social condition of the industrial population he premises, and the character of the education it should receive to fit the national mind to cope with the national progress cannot be met by an extension of scholastic institutions, based on the requirements of the middle ages.

Yet this is the principle which has dominated the universities, and "until very lately no concessions have been made to the reasonable demands of progressive civilization."

Secondary and primary education are left in no better condition with reference to this point.

The improvement in the technical education of the masses, however, which has begun in the board schools and is destined to widen, will necessitate a like improvement in all the grades above them.

The English, nevertheless, are gaining in artistic development, and the freedom of choice and the individuality of the English artist are beginning to tell abroad, and English taste in architecture and ornamental design is rapidly supplanting continental.

It is to England that Germans come for Christmas cards, original ornamental pottery, patterns for embroidery, etc.; and in "Vienna lately I could scarcely buy a souvenir that was not adorned with cuttings from Kate Greenaway's charming crudities."

The Royal Commissioners of Technical Education show in their reports that, among the French, it is not in the technical education of the ordinary working classes that the differences sought are to be found, and the reports of the French commissioners reveal a state similar to that prevailing in England, so far as their ordinary workmen are concerned. Schools of art and trade have been established, but their pupils expect to be foremen, not workmen. Apprenticeship schools have also been started, with more promising results.

The best and most successful technical schools are in Switzerland and Germany, and conform, as a rule, with Professor Ayrton's definition that they are not a school where the manipulation or routine of a trade is taught, but one where a lad receives general instruction in the principles of applied science, and special instruction in the application of those principles to the particular trade he is following, or which he is about to follow.

In them everything is taught that can be gained in the universities, except the dead languages; while modern languages and the application of modern science to art and industry are added, with such thoroughness that nearly all the leading men of England have found it desirable to spend some years in Germany.

In the *Polytechnikum*, at Zurich, Professor Meyer teaches chemistry in a purely scientific direction, irrespective of any practical application, and another treats the chapters which refer to practical application.

A Timely Warning.

If the statements coming from the various electric-light companies are to be relied upon, there is reason to believe that powerful electric-currents are soon to be distributed throughout the city. This being the case, it would seem but proper at this time to consider the means by which this is sought to be accomplished. The many accidents that have occurred since the introduction of one system (voltaic-arc) both here and abroad, have demonstrated conclusively that more than ordinary precaution is required for the proper laying of electric-mains. If the human body be placed in the circuit, of a dynamo machine, the partial or entire passage of the current may, if the machine be powerful, cause instant death, or if the machine be of smaller size, produce a painful, not to say dangerous, shock. To accomplish this, the body must be placed in the circuit of the machine, in other words, the current must be enabled to enter the body at one point and to pass out and back to the circuit from another point. Thus, a break is made in the wire, and the body is inserted in this break.

The knowledge of the working of the ordinary frictional machine will not avail to protect a person approaching the conductors from a dynamo-electric generator. Touch any part of a charged conductor from the former and you completely discharge it, the person so touching it, himself conveying the current to the ground through the interposition of his own body. But a person touching an incompletely insulated conducting wire while it is transporting a powerful electric-current from a dynamo machine such as is and will be used in electric-lighting, would not convey the discharge through his body to the ground because he would not be placed in the circuit. He would thus provide a place for the current to enter his body but none by which it might flow back through him to its generator. If, by some possibility the wire should touch the ground, particularly, if the ground were wet, then his feet might be connected through the wet earth with another portion of the circuit, for water is one of the very best conductors, and two paths would thus be opened to the current. Then even there would be a dangerous passage of current through his body.

This much of danger to life. The danger to property by fire through defective insulation of electric mains coming from dynamo-machines, is by no means inconsiderable. Even when carefully and thoroughly insulated, the mains, if not properly tested, may prove dangerous. For insulation may be cut by the hooks with which the wires are affixed to walls or they may become defective through abrasion with gas-pipes or other wires by turning sharp corners.

Recent experiments have shown that it is not safe to ground the wires leading from the dynamo machine, that is to say, that no attempt should be made to force the current to return to the generator via the earth, but that, instead of this, one continuous line of wire should be provided by which such return could be accomplished.

These experiments have shown further that electric mains should not be laid so as to cross gas pipes or lines of shafting. If this is absolutely necessary, then special attention should be paid to the insulation of those points on the wires that come in contact with the pipes or shafts so crossed. For, should the insulation be defective at these points of intersection, it would result in grounding that portion of the wire.

In order to avoid danger to life through the careless handling of the wires or mains, these should be placed safely out of reach or be protected with heavy insulation. Were there but one electric-light company such precautions as these would be, to a certain extent, unnecessary; for with plenty of time in which to work, there would be a likelihood that the laying of the pipes would be carefully and scientifically attended to, regardless of expense. But everybody knows that rival companies, each struggling to be first in the field, are apt to be indifferent to what seem important details until, through lack of such inattention, evil befalls. Hence this warning.

The Western Union Telegraph Company has issued an order reducing the rates in and between the Eastern and New England States, to take effect October 1.

The rate of 25 cents for the first ten words and 2 cents for each additional word is made uniform between cities in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut; also between offices in New York State; also between offices in New Jersey, and between offices in Pennsylvania. The same rate will be charged from offices in the New England States to New York City, Brooklyn, N. Y., Jersey City, N. J.; and Stanstead, Que.; also from New York City, Brooklyn, N. Y., and Jersey City, N. J., to offices in the New England States; to Stanstead, Que., and to offices in Pennsylvania and New Jersey; also from offices in New Jersey to New York City and Brooklyn, N. Y.; also from offices in Pennsylvania to New York City and Brooklyn, N. Y., and Jersey City, N. J.; also from offices in New York State to Jersey City, N. J. The maximum rate between New York, New Jersey, and Pennsylvania will be reduced fram 50 cents to 40 cents for ten words.

The new rates will apply to Great Northwestern as well as to Western Union offices in the States of Maine, New Hampshire, Vermont, and New York. The present rates between New York, Philadelphia, Baltimore, and Washington, and the local rates in the oil regions will be maintained.

Electrical Notes.

It is not expected that all young men, after leaving a college or university, will know much about physics: but it is a singular fact, and one that can easily be corroborated, that even those who discovered a natural taste for this study, and passed well in it on examination, may be expected as a rule to be all at sea when called upon for practical work.

***

Now, if this means anything, it means that the nature of the instruction given in most of our colleges is lacking in efficiency.

***

Aware of this fact, Prof. Mendenhall recently made some timely suggestions.

***

Believing that theory and practice should go together, he suggests that quantitative work should occupy the attention of the student, while illustrative experiments and the qualitative work necessary to a good understanding of the subject should be relegated to the lecture table of the instructor.

***

That which the pupil gets which is of most value in his course in a physical laboratory is not a familiarity with the principles of the science, but a training in the methods of investigations in use among physicists including a knowledge of the use and abuse of experiment and the necessary limits of our knowledge derived therefrom.

***

The study which he ought to make of errors, instrumental and accidental, must prove of great value in various fields.

***

It is better for the laboratory to contain a few instruments of precision than a large number of inferior performance and accuracy.

***

It is not a matter of great importance upon what particular department of physics a student shall spend his time and strength.

***

The underlying principles of the method are common to all, and skill in one begets facility in the others.

***

To sum up, the course of study in physics for the undergraduate collegian should include a sufficient training in mathematics to enable him to apply his knowledge with ease and facility to the more common physical problems, a thorough and exacting course of text-book and lecture work in which the application of his mathematical knowledge would be made, and during which all illustrative experiments necessary to a complete understanding of the text should be exhibited by the instructor from the lecture table.

***

This should be supplemented by a course in the laboratory in which more attention is paid to the quality than to the quantity of work done, during which every problem is discussed as far as possible, both mathematically and experimentally, and especial attention is given to the discussion of the results of experiment and of the more elementary portions of the theory of errors.

***

Prof. Mendenhall says that looking upon the subject as being divided into three parts he is unable to say which is the least important.

***

Quite recently the ELECTRICAL REVIEW described a process discovered by a New Jerseyman for manufacturing hen's eggs, and declared that this, indeed, was the very acme of ingenuity.

***

In looking over a recent number of the London *Lancet*, however, I find that the aforesaid New Jerseyman will have to resign the laurel to a Frenchman, for this Frenchman has succeeded, so it is said, in doing nothing less than constructing a mechanical nurse for babies.

This is how he was led to the discovery of the principle.

***

In 1878 Dr. Tarnier, while studying at the *Jardin d'Acclimatation*, in Paris, the apparatus devised by M. Odile Martin for artificially hatching and rearing chickens, suggested that a similar method might readily be applied to infants, especially in case of [premature birth.

***

Two years, however, elapsed, according to the *Lancet*, before any attempt was made to carry out this proposal.

***

Finally, however, the *couveuse* or mechanical nurse was made and brought to the hospital of the maternité.

***

It is a plain wooden box, measuring about 2 feet 8 inches by 2 feet 4 inches, and having a height of 2 feet 4 inches.

***

It has a double covering, the space between being filled with sawdust to retain the heat, and is divided into two parts.

***

The lower half contains a reservoir which holds about sixty liters of water, and is fed by a patent boiler that stands outside the box, and is warmed by an oil lamp or hot water, may be used without recourse to the lamp.

***

The upper portion of the box forms a warm chamber, where a little basket or cradle is placed, large enough to hold two infants.

***

From an opening in the side, this cradle may be withdrawn, while the top of the box has a double glass covering, so that the children, and the thermometer lying by their side, can be constantly watched.

***

If the water used in the first instance is cold, it takes a long time to attain the required temperature, but once this is done the lamp need only be relit three or four times during the course of the day.

***

It is best to warm the apparatus while the infants are being fed or washed

***

The temperature within the *couveuse* is generally maintained at 86° F., and though the contrast on withdrawing the child to be fed or washed is very great, amounting often to 30° F., colds, so says the *Lancet*, are not so frequent as among the infants nursed in the ordinary manner.

***

The experiment is considered so successful that it is proposed to supply all the hospitals of France with a *couveuse*.

***

Nor is this all.

***

A small portable *couveuse* is now about to be tried which could be carried by hand from house to house.

***

No doubt in the future perambulators will be constructed upon a similar pattern.

The Electric Light at Providence, R. I.

For months past Mr. Edward H. Goff and his able assistants have been laying out the plans and superintending the construction of a new electric light plant at Providence, R. I. The work has been completed, and the formal opening of the new lighting station of the American Electric Illuminating Company took place on the 20th ult. The company have leased the first floor of the Barstow building, and the new quarters were brilliantly illuminated by their splendid electric lights for the first time on the above date. At the door was a corona of four lights, which made all the surrounding vicinity as light as day. The station is equipped with a 200-light plant with capacity for increasing to 1,000 if necessary. The rooms are spacious, and the station has been pronounced by experts to be the finest of its size in the country.

The main room where the plant is located, is about 100x45 feet and contains four 50-horse power Armington & Sims engines, making 275 revolutions a minute, which run eight 25-light dynamos, furnishing electricity for 200 lights. The steam power for the engines is obtained from two tubular boilers, each of 100-horse power, made by Cunningham Bros. of Boston, and set with the celebrated Jarvis furnace, and have connected with them the Korting injector, the Dean steam pump and the Burman heater. In fact, all the machinery and appliances are of the best manufacture, and everything has been done to make this one of the finest electric lighting stations in the country.

One of Providence's industries that has made electric lighting possible was seen here in five of the Armington & Sims engines, whose lightning-like speed and simplicity of build has made them one of the notable inventions of the age, and they were the subject of comment by the visitors as well as the electric light.

Among the distinguished gentlemen present were Mayor Hayward and members of the city government, Mr. H. E. Wellman, Hon. Ellery Wilson, of the Rumford Chemical Works; Major-General Wm. S. Rosencrans, Gen. O. H. Lagrange, of California; Mr. G. Sims, Superintendent Armington & Sims Engine Company, of Providence; Mr. M. F. Moore, of Edison Electric Light Company, New York; Mr. C. B. Whiting, Worcester, Mass.; Mr. C. E. Clifford, cashier Wachusett National Bank, Fitchburg, Mass.; Mr. W. A. Fairbanks, director of same; Mr. L. J. Brown, President Wachusett Electric Light Company, Fitchburg, Mass.; Mr. R. A. Cobb, Russ, Cobb & Co., Boston; Mr. Wm. A. Hovey, President Merchants' Electric Light and Power Company, Boston; Mr. M. Lee Ross, general manager same; Mr. H. E. Irvine, treasurer American Electric and Illuminating Company; Mr. Alderman Haldeman, Boston, who inspected the new station under guidance of Mr. E. H. Goff, President and general manager of this enterprising company.

The lights received the universal approbation of all those present for their steadiness, and the softness and brilliancy of their illuminating power, and a number of business firms have already given contracts for lights. The future of the company certainly looks flattering, and a petition will be presented at the next meeting of our city government to give them a contract for street lighting.

Telephonic Progress on Long Island.

General Superintendent Sargent of the Long Island and New Jersey Telephone Company in a recent interview with a reporter said concerning the telephone business:

"There is but one telephone, and that is the Bell, which was patented first in March, 1876. There were several improvements which appeared immediately after that, of which Edison's was the most prominent. His improvement—which it was—was in the transmitter, not in the telephone; and it was so decided by the Patent Office. Exclusive of the wire, or conductor, there are only two parts of the instrument, namely, the receiver and the transmitter. There are several styles of transmitters, but the only two in use are the Edison Carbon Telephone as it is called—the carbon used is really soot—and the Blake Microphone Transmitter. The telephone now in use is a perfect instrument, leaving little or nothing to be desired in the way of improvement, except what we have to contend with in the conducting apparatus. The difficulty with this is that the wires take up currents from the earth and from the neighboring wires, and these interfere with the current which transmits the sound of your voice in talking. That bubbling sound, for instance, which we often hear on the wires comes from the dynamo-machines in use by the Electric Light Company and the Western Union. Over country districts we have only the light interruptions that comes from the earth currents, and so we are all able to talk over 400 to 500 miles of wire, whereas it is almost impossible to hold a conversation between here and Philadelphia."

"Is it not possible to overcome this objection by insulation?"

"No, sir; at least, it has not been done; though the means of communication are being improved all the time."

"Is the telephone in use under the water?"

"Well, we cannot get into New York without crossing the water, and we use a cable from New Jersey which is probably a mile in length. This is the longest one in use here, with the exception of that which runs from Newark to Jersey City, in use by an oil firm, and which is about 10 miles in length. It has been laid only recently, but I believe is successful, reasonably so; but when you put a cable underground or through water a difficulty is found that we do not have in overhead wires. This is the effect of retardation, which is produced by the earth currents. The earth is the universal conductor, and the difference between these currents and the currents coming into overhead wires is as 1" to 40 ft. That is to say, while the message is conveyed as rapid by cable as by the overhead wires, or nearly so, the tones are less distinct—they are more or less blurred. I might compare it with the talk of a man with a blanket over his head and the talk of the same man in the open air. In Europe they have much longer telephone cables, and according to the scientific papers they talk readily across 60 or 70 or even 100 miles of cable. Beyond that distance you can get nothing but a musical note, there being no enunciation at all."

"What progress has the telephone made since 1876?"

"I am now gathering statistics on the subject, and at this moment cannot answer difinitely; but I could give you something about the extent of its use in our own neighborhood. Brooklyn and Long Island together have about 1,800 subscribers who can communicate with each other. In New Jersey our territory includes Long Branch, Paterson and other places within a radius of 35 miles of the New York City Hall. That territory contains about 1,900 subscribers who are in communication with each other. These include business and private houses. I could only guess now at the number of miles of wire they use, but I should say that it is about a mile each, or about 3,700 miles New York City alone has about 4,000 subscribers, and when you include the trunk lines, I suppose there are about 2 miles of wire to each one."

"There is a duplex and even quadruplex system of telegraphing; is there any means of sending more than one message at once through the telephone?"

"The principle is not the same in the telegraph as in the telephone in this case. In the telephone, if you fix your attention upon one talker out of half a dozen speaking at once, you can catch what he says. The telephone will convey them all, the electric current conveying them all in the same way that the air itself does, and so two messages can be sent in opposite directions at the same time over the same instrument, without interfering with each other, provided you can catch the one you want. Where the two currents met and coincided, they would raise the vibration at that point, and where they did not coincide, they wou'd tend to straighten out; but the difference in speech is so great that, practically, they never coincide. If you can single out one voice out of half a dozen talking at once you can get it on the telephone just the same as in a room. As to the increase in the use of the telephone, I may that it is steady and rapid, too, and there is no telling to what extent it will be used in future.

Mr. Gillett Still at Work on His Telephone.

There is an inventor in the village of Flushing, Long Island, who believes he has an apparatus that will revolutionize the telephone business, and materially increase the usefulness of the Atlantic cable. He has rooms in a large boarding-house about a

block from the railroad station. Here he has passed the last four months at work upon his invention. His name is Webster Gillett. He is from Michigan.

The inventor appeared to be about forty years old. On the largest table in the room stood a disk about thirteen inches in diameter. Projecting from the center of one face of the disk was a funnel-shaped object. Running into the table from the lower edge of the disk were a number of wires. On the table arranged in a row a short distance from the wires were ten black cylindrical induction coils. That is what the reporter noticed. This the inventor said:

"That funnel-shaped object in the center of the disk is the resonator. You see that it is not like the speaking tube of an ordinary telephone. The larger part of the funnel is held to the mouth. The volume of the voice, instead of being concentrated in a small space, as in other telephones, is spread over and causes the whole metallic diaphragm to vibrate. You will notice on the opposite side of the disk there are ten deviating points which are held in position by ten rubber arms that may remind you somewhat of a cuttle-fish. When you talk through the speaking tube or resonator, the metallic diaphragm, or, popularly speaking, the tin plate, vibrates. The vibrations are communicated to the ten deviating points or needles. The needles penetrate through rubber cushions into small brass cylinders containing granulated carbon. The cylinders are secured in their places by ten brass arms attached to the rim of the disk that holds the metallic plate. Ten wires run through the arms from the primaries of the induction coils and return to their respective poles. The ten secondary wires from the induction coils are carried to a plug switch, so arranged as to place one or as many wires as may be desired in circuit. The power of ten batteries, ten induction coils, and a corresponding number of deviating points, acted upon simultaneously by a single vibrating tin plate, may thus be concentrated upon a single wire. This is something that has never been done before. I claim that conversation may be carried on over an ordinary telegraph wire, with my telephone, between points 2,000 miles apart. Twelve words a minute is considered a fair rate of transmission over the Atlantic cable. By using this telephone 120 words a minute may be transmitted, if a short-hand writer is employed as a receiver. All the important features of my invention are new. By the use of the granulated carbon and the rubber cushions, into which the needles penetrate, I secure a steady, uninterruptable sound."

Mr. Gillett went into an adjoining room, where he had another telephone connecting with the one on the table. The receiving-tube of the new apparatus was put in position. After a few minutes it began to emit a series of distinct "hellos" in a bass voice.

After returning to the room Mr. Gillett said that ten batteries, ten deviating points, and ten induction coils have about six times the power of one battery, and a corresponding number of other necessary electrical agencies. He thought the time was not remote when we could not only speak across the ocean, but also see those to whom we might be speaking. He said that an experiment with the new telephone probably would be made in ten days between places in Maine and Massachusetts, five hundred miles apart.

Taking Time.

The annual report of the astronomer in the observatory at Yale College gives some interesting reports of the work in his department of horology for the last year. From these it appears that the American Watch Company, of Waltham, Mass., received twenty-two Class 1 certificates for watch movements, and next to the highest mark during the year 1883. Barrand & Lunds, of London, stood at 82, and Constantin & Vacheron, Geneva, Switzerland, 85. The observatory furnishes time by signals to the headquarters of every railroad in Connecticut.

To encourage the public confidence in the accuracy of these teltgraphic time signals, the custom has been established of furnishing, as a news item to all the newspapers in the State, the mean monthly errors of these signals at 12 o'clock noon. This time is identical with that of New York City.

The report suggests the establishment of a school of horology in this country. The report says:

"A school of this character is, no doubt, needed by one of our leading industries, and it will not be difficult, should the financial support be furnished, to establish a course of study and manipulation which should lead to a certificate of training and ability in this direction."

Steam vs. Water Power.

The minimum capacity and height of fall of some of the leading water powers of the United States is as follows:

Holyoke, fifty feet, 17,000 horse-power.

Cohoes, No. 3, 105 feet, 14,000 horse-power.

Lewiston, fifty feet, 11,900 horse-power.

Lowell, thirty-five feet, 10,000 horse-power.

Lawrence, twenty-eight feet, 10,000 horse-power.

Turner's Falls, thirty-five feet, 10,000 horse-power.

Manchester, fifty-two feet, 10,000 horse-power.

Paterson, thirty-five feet, 1,100 horse-power.

Passaic, N. J., twenty-two feet, 900 horse-power.

Birmingham, twenty-two feet, 1,000 horse-power.

Fall River, with at least 500,000 more cotton spindles than any other town or city in the United States, is operated wholly by steam power.

Manufacturers have been heard to say they would not move across the street for the sake of substituting water for steam, considering the irregularity of most water powers. A more moderate statement is that of the manager of a prominent woolen mill on the seaboard, whom the writer asked if it would not be cheaper to run his mill by steam than by water. The answer was: "For a mill located as mine is, steam is the cheaper. I use half anthracite screenings, and half culm coal from Nova Scotia. The average cost of both kinds of fuel landed on our wharf is $3 25 per ton, and at that figure steam is cheaper than water."—*Textile Gazette.*

For drilling holes in glass, a common steel drill, well made and well tempered, is the best tool. The steel should be forged at a low temperature, so as to be sure not to burn it, and then tempered as hard as possible in a bath of salt water that has been well boiled. Such a drill will go through glass very rapidly if kept well moistened with turpentine in which some camphor has been dissolved. Diluted sulphuric acids are equally good, if not better. It is stated that at Berlin glass castings for pump barrels, etc., are drilled, planed and bored like iron ones, and in the same lathes and machines, by aid of sulphuric acid. A little practice with these different plans will enable the operator to cut and work glass as easily as brass or iron.

President Garrett, of the Baltimore and Ohio R.R., has ordered that employes of the road shall have a two weeks' vacation with passes over the line and no reduction of salaries. Employes will appreciate such liberality in a way that will operate to the company's advantage.

All the coffee grown in the New World has sprung from a single plant, which a French naval officer carried to Martinique in 1720, depriving himself of water when parching with thirst in order to nourish his coffee plant. From this one tree, it is said, all the American tropical colonies obtained their seed, which has multiplied to such an extent that Brazil, Mexico, and the West Indies produce as much coffee as Java and Ceylon.

Paying for Its System.

A dividend of 33⅓ per cent. in bonds and 33⅓ per cent. in stock of the Postal Telegraph Company has been declared to the stockholders of the Electro-Graphic Manufacturing Company, of which Charles Jenkins is President, payable October 1. Each holder of 300 shares of the Electro-Graphic stock will be paid $1,000 in bonds and 100 shares of the stock of the Postal Company. This dividend is the result of the sale to the Postal Telegraph Company of the Electro-Graphic sytsem of telegraphy, which forms the basis of the Postal Telegraph system. The price paid for the system was $1,000,000, one-half in bonds and the other half in stock of the Postal Company.

Messrs. Watts, Campbell & Co., of Newark, N. J., are doing a larger business than at any previous time. Among the recent orders for their Corliss steam engines are included:

One 18x42" from the United States Illuminating Company, one 20x48" from Geo. F. Hall, one 14x32" from M. & H. Schrenkheisen, one 14x32" from Althouse Iron Works, one pair 20x48" from Wm. Wicke & Co., one 20x42" from Wynkoop & Hallenbeck, one 24x56" from Brush Electric Illuminating Company, one 18x36" from L. Prahar & Bro., one pair 18x42" from Trinity Church Corporation—all the foregoing being in New York City; also one each from Wm. O. Headley & Son, Wm. T. Mersereau & Co. and H. M. Strieby & Co.—all of Newark; together with one 26x48" from the Fairmount Worsted Mills, one 18x42" from Thos. Jaggers, Philadelphia, and two 24x48" from the Conglomerate Mining Company, Philadelphia, the engine being sent to Lake Superior.

At Reddich, Germany, 14,000 persons are engaged in making needles. The total production of needles in the world is 200,000,000 per week, or 10,000,000,000 per year.

The returns of the census taken on Jan. 1, 1883, which have just been published, show that the Empire of Japan contained a population of 36,700,100, made up of 18,598,998 males and 18,121,000 females.

Krupp's works, at Essen, now employ 439 steam boilers; 456 steam engines, with an aggregate horse-power of 18,500; 89 steam hammers, varying in weight from 200 pounds to 50 tons; 21 rolling mills; machines for making tools, 1,622; furnaces, 1,556, of which 14 are high furnaces; 25 locomotives and 5 propellers, with a tonnage of about 8,000. Annual production, 300,000 tons steel and 26,000 tons iron.

Ohio, with 20,699 establishments, employs a capital of $188,930,614, consumes material valued at $215,098,026, and turns out products valued at $348,385,390. New York is credited with 42,739 establishments, a capital of $679,578,650, and value of products $1,080,638,696 annually. Illinois, with 14,549 establishments, employs a capital of $140,652,066, uses material valued at $289,826,907, and turns out products valued at $414,864,673. Massachusetts, with 14,352 establishments, employs a capital of $303,806,185, uses $386,952,650 worth of materials, and turns out products valued at $631,511,484 annually.

The New York Electric Light Company, of New York, has made a contract with the Pennsylvania Company, operating the Pittsburgh, Ft. Wayne & Chicago Railroad, which may result in the lighting of all their freight yards with the electric light. The contract calls for trial in the Allegheny yards, at the Outer Depot. The railroad company is to furnish the power and the electric light company the remainder of the plant. The trial is to last for sixty days, and if it is successful it will be retained and used, not only in the Allegheny yards but also at other points. The plant is to be erected as soon as practicable.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 18, 1883.

284,909—Dynamo-Electric Machine, Alex. Bernstein, Boston, Mass.

285,004—Mechanical Telephone, William J. Bowen, Norwalk, Ohio, assignor to himself, P. P. Kechler, Cincinnati, O., and Z. C. Phwing, Marshall, Mich.

285,005—Electric Photographers' Retouching Point, John Thomas Burke, Nebraska City, Neb.

285,027—Dynamo-Electric Machine, Joshua Gray, Medford, Mass.

285,066—Galvanic Battery, Fenner H. Peckham, Jr., Providence, R. I.

285,076—Fire Alarm Telegraph, Edwin Rogers, Brookline, Mass.

285,088—Electric Time Signaling Device, Henry G. Van Wagoner, Monroe, Wis.

285,102—Telephone Transmitter, Emile Berliner, Boston, Mass.

285,107—Electric Arc Lamp, Robert Bucker, Elizabeth, N. J.

285,245—Telephone Exchange System, Joseph E. Fenn, Elizabeth, N. J.

285,249—Dynamo-Electric Machine, Frederick K. Fitch, assignor to the Fitch Electric Lighting and Construction Company of New York.

285,267—Insulation of Electrical Conductors, Woodbury S. How, Philadelphia, Pa.

285,327—Electric Cable Support or Hanger, Albert S. Weaver, Providence, R. I., assignor by mesne assignments to himself and Lucius Chandler Angell, same place.

285,334—Electric Burglar Alarm, Alvah Wiswall, Cincinnati, O., assignor of one-half to Mathew Britton, same place.

285,342—Signaling Apparatus for Telephone Exchange Systems, James H. Cary, assignor to the Cary Telephone Signal Company, Boston, Mass.

285,353—Propelling Cars by Electricity, Jos. R. Finney, Pittsburgh, assignor to himself and Thomas B. Kerr, Allegheny, Pa.

Telephone Stock Quotations.

American Bell Telephone Company	225
Bay State Telephone Company	123
Central New York Telephone and Telegraph Company	101
Boston and Northern Telephone Company	135
Empire State Telephone and Telegraph Company	203
Granite State Telephone Company	95
Hudson River Telephone and Telegraph Company	110
Long Island and New Jersey Telephone Company	100
Mexican Telephone Company	2½
National Bell Telephone Company of Maine	90
New York and Pennsylvania Telephone Company	100
Northwestern Telephone Company	100
Southwestern Telephone Company	68
Suburban Telephone Company	139
Southern Bell Telephone and Telegraph Company	125
Tropical Telephone Company	3
Central Union Telephone Company	100
Iowa Union " "	100
Missouri and Kansas Telephone Co.	90
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	130
Cumberland Telephone Company	105
Great Southern Telephone Company	102
Michigan Telephone Company	115
Chicago Telephone Company	290

The Secretary of State of Illinois has given a license to organize to the Decatur Electric Light Company, whose capital stock is placed at $100,000. The corporators are Silas T. Trobridge, J. R. Mosser, and B. S. Heath.

There are only four nations in the world to-day that are paying their way. England generally manages to make ends meet and show a trifling surplus of 2,000,000 or 3,000,000 to be applied to the reduction of its enormous national debt; the United States, in spite of Congressional extravagance, puts by nearly 50 times as much; and Holland and Belgium both keep about even. With these exceptions every nation in the civilized world shows an annual deficit of more or less millions.

Manufacturing News.

Wright's Cable Clip is a very useful invention for suspending ærial telephone or telegraph cables. These clips are easily and quickly applied, the time saved by using them will more than pay any party erecting cables.

They are made from the best blown iron, (galvanized), are absolutely secure, look neat and snug when put up; will outlast any cable; can be hooked up or taken down at will without the aid of any tools; work equally well on fibrous, lead, or wire armored cables.

Every party who has given them a trial, speak in the highest terms of the invention and continue to order.

These patents are owned and operated by the Rhode Island Electric Company.

Money has begun to flow from Europe while the receipts of American securities are also heavier. The gold-importing season was inaugurated last week by the arrival of the Neckar with 600,000 francs or $120,000 in French coin, and the Bohemia with 500,000 francs or $100,000. The consignees of the latter cargo are expecting an additional $150,000 this week. J. & W. Seligman & Co., are expecting 1,250,000 francs by the Elba, which sailed from Europe on Saturday.

The Superior Nail Company of Chicago, capital $200,000, incorporators Robert L. Martin, Joseph Barlee, and Daniel W. McGillicuddy. The purpose of the company is to manufacture horseshoe nails.

The Jarvis Engineering Company, Boston. Mass., have closed a contract with the Thomson-Houston Company to equip an electric light station in Syracuse, N. Y., of one hundred lamps. They will furnish and set one 100 H. P. tubular boiler set with the Jarvis Patent Furnace to burn screenings and slack coal; two 9½"x12" Armington & Sims Company engines to run the dynamo electric machines without shafting, steam pump, &c., to make a complete station. The plant will be laid out so to allow its being increased to four hundred lights run by eight separate engines.

The Standard Electrical Works of Cincinnati, O., are driven to their fullest capacity on their Standard Bells and other telephone exchange apparatus. They are exporting Bell's very largely to Europe, which is good evidence that they are liked much better than the home manufacture. Their telephone business seems to be making rapid strides.

The importation of silk goods in August, 1883, were but $3,806,951 compared with $5,032,381 for August, 1882.

Louisville is about to introduce the same underground wire system that is in use in Chicago for the telegraph and electric light wires. It may be a success, but it would be wise to wait a short time and see it tested before making a very large outlay.

A syndicate in Galveston proposes to build wharves out to deep water in the Gulf of Mexico. To do this they will try to borrow $5,000,000 of the State's surplus, which will exceed $5,000,000 two years hence, and will be $10,000,000 within five years if the State sells the school lands.

The Stedman & Fuller Manufacturing Company, of Lawrence, has been organized with a capital of $80,000, for the manufacture of card clothing and leather belting. George A. Fuller is president, W. L. Haines is treasurer, and Arthur L. Kelley is a director.

The Telephone Convention, to be held at Cincinnati on the 16th prox., is almost at hand. See editorial on eighth page, this edition.

Latest statistics show that Alabama has 2118 factories, working 8248 hands, with a capital invested of $5,714,032, paying annually in wages $2,227,968, and yielding annually in products $13,040,644.

Mississippi has 1731 factories, working 5941 hands, with a capital invested of $4,501,714, paying annually in wages $1,579,428, and yielding annually in products $8,154,758.

South Carolina has 1584 factories, working 8141 hands, with a capital invested of $5,400,418, paying annually in wages $1,543,715, and yielding annually in products $9,858,081.

Louisiana has 2557 factories, working 30,071 hands, with a capital invested of $18,313,974, paying annually in wages $4,593,470, and yielding annually in products $24,161, 905.

The California Cotton Mills Company has been incorporated with a capital of $600,000. The factory will be located at Oakland.

It is estimated that the wool crop of 1883 will exceed that of the preceding year by 15,000,000 to 20,000,000 pounds, and that not more than 50,000,000 pounds of foreign wool will be required to make up the balance needed by our manufacturers, over the home product. This shows a still closer approach to the time when we will grow enough wool for our own use, and live independently, in this particular, of all other countries.

Messrs. N. W. Ayer & Son, of Philadelphia, have issued a "Newspaper Annual" which crowds into 910 pages the agglomerated information of a library. It is well printed, handsomely bound and generally excellently prepared to make itself welcome in every newspaper office.

BUSINESS NOTICES.

SITUATION WANTED—By a young lady in a telephone exchange; has had three years' experience in the business, and is thoroughly well posted. Address Lock Box 22, Schoharie, N.

FOR SALE—United States and Canadian rights in an arc lamp; inventor desires to sell his patents outright for a moderate sum. Address "Arc Lamp," P. O. Box 3329, New York City.

WANTED—An experienced telephone man of ability who can take the position of superintendent or manager, and can speak the Spanish language. Address "M. C." care of this office, P. O. Box 3329.

A mechanical and electrical engineer, graduate of the United States Naval Academy, desires an engagement; highest testimonials. Address G. S., 25 Bowdoin street, Boston, Mass.

WANTED—By September the 30th, a situation by a young man of large practical experience in an electric light company, to put up or run dynamo machines; can adjust and regulate lamps, run line wires, etc. Address, "Experience," P. O. Box 3329, New York.

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We solicit a continuation of the favors heretofore extended by customers to the late firm of Davis & Watts, in the assurance that we can, and will make it to their advantage.

We have in preparation a new illustrated catalogue, which, when ready, we shall be pleased to furnish.

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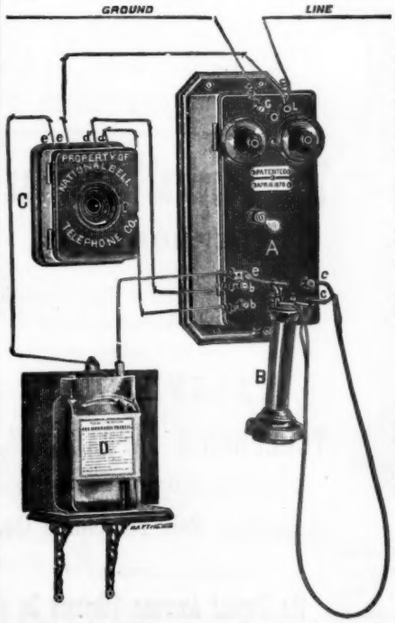

This Company, owning the Original Patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents, covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company, and the Harmonic Telegraph Company, the patents owned by those companies, is now prepared to furnish, upon application, either directly or through any of its licensees. Telephones of different styles, and applicable to a variety of uses.

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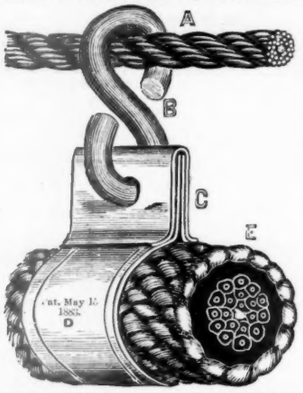

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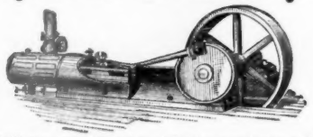

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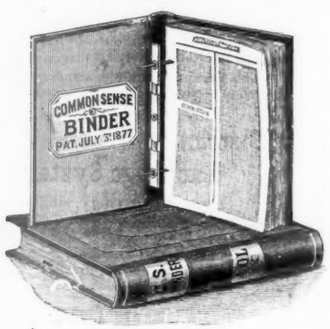

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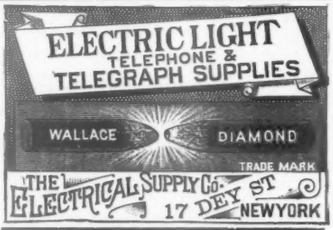

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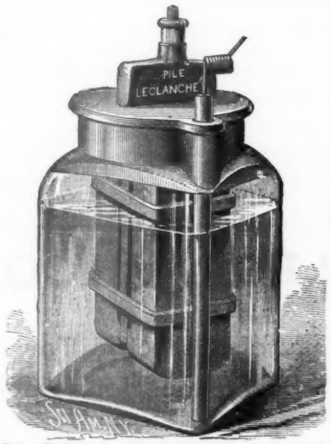

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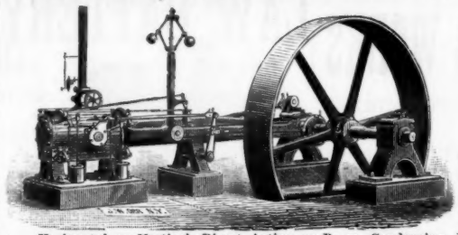

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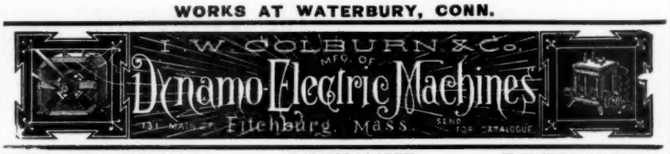

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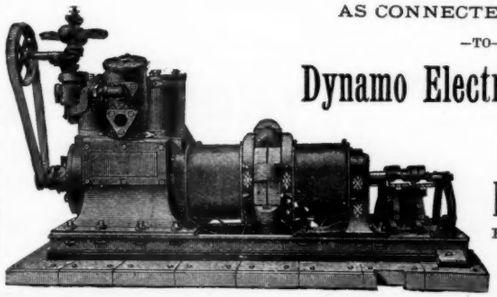

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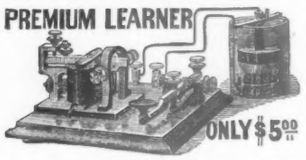

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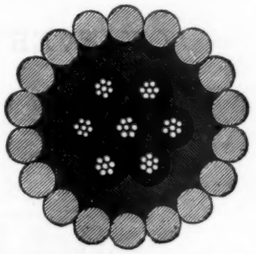

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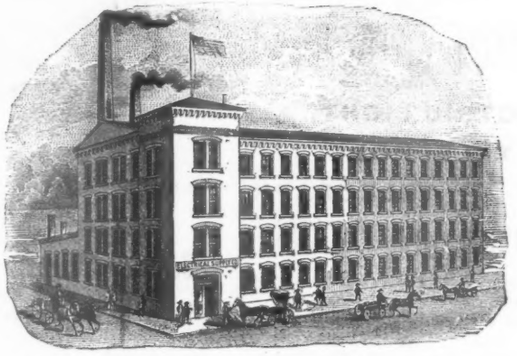

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